REPTILES AND AMPHIBIANS

A. NICOL SIMPSON

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PEEPS AT NATURE

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BRITISH REPTILES AND AMPHIBIANS

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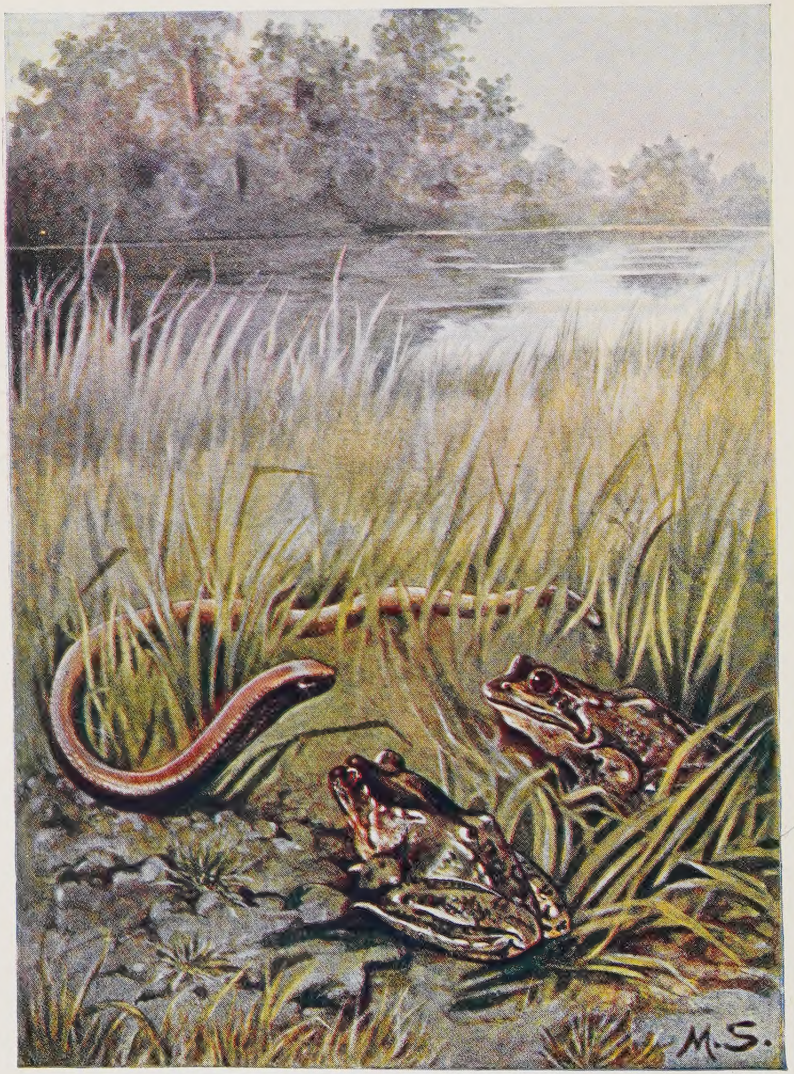

1. Common Frogs (*Rana temporaria*).
2. Slow-worm, or Blind Worm (*Anguis fragilis*).

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BY

A. NICOL SIMPSON, F.Z.S.

AUTHOR OF "BRITISH LAND MAMMALS"

WITH A CHAPTER BY

REV. CHARLES A. HALL, F.R.M.S.

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EDITORIAL NOTE

This little volume, dealing with the British Reptiles and Amphibians, may well find a place in the "Peeps at Nature" Series. Britain has few representatives of these two classes of animals, but their fewness in number has enabled the author to deal with each species at some length; and, besides, we have the additional advantage of being able to illustrate all but two of the British species in colour. We are indebted to Miss Scrivener for the capable way in which she has prepared the drawings from which the coloured plates have been prepared. The reader's attention is particularly directed to the series of photographic reproductions on Plates III., V., VI., XI., and XII., which illustrate admirably the story of the development of the frog.

The publication of this volume is another step towards the accomplishment of our ideal—the giving

to the nature-loving public a series of books which will, it is hoped, ultimately cover practically the whole gamut of nature, particularly as represented in the British Isles.

CHARLES A. HALL.

Paisley, 1913.

CONTENTS

CHAPTER		PAGE
	EDITORIAL NOTE	v
I.	INTRODUCTORY	1
II.	BRITISH REPTILES: LIZARDS	6
III.	BRITISH REPTILES: SNAKES, TWO TURTLES	31
IV.	BRITISH AMPHIBIANS: NEWTS	49
V.	BRITISH AMPHIBIANS: TOADS AND FROGS	64
VI.	CLASSIFICATION	77
	INDEX	85

LIST OF COLOURED AND PHOTOGRAPHIC ILLUSTRATIONS

PLATE		
1.	SLOW-WORM—COMMON FROGS*	*frontispiece*
		FACING PAGE
2.	COMMON LIZARDS	5
3.	FROG SPAWN—DITTO THREE DAYS LATER	12
4.	GREEN LIZARDS*	17
5.	FROG SPAWN: FURTHER DEVELOPMENTS	21
6.	TADPOLES WITHOUT LEGS: TADPOLE WITH HIND- AND FORE-LEGS	28
7.	SAND LIZARD—SMOOTH SNAKE*	32
8.	RINGED OR GRASS SNAKE*	37
9.	VIPER OR ADDER*	44
10.	BRITISH NEWTS*	49
11.	TADPOLES WITH HIND-LEGS	53
12.	TADPOLE: TAIL BEING ABSORBED—TOAD SPAWN	60
13.	WALL LIZARDS*	64
14.	RADIOGRAPH OF TOAD	69
15.	EDIBLE FROG	76
16.	NATTERJACK TOAD—COMMON TOAD*	80

* These eight illustrations are in colour; the remainder are in black and white from photographs.

BRITISH REPTILES AND AMPHIBIANS

CHAPTER I

INTRODUCTORY

The word "reptile" is not a pleasant one in British phraseology from whatever point it may be viewed. To the average person the word denotes a loathsome creature that crawls subtly amongst the herbage, and whose very touch means danger. This aversion is not confined solely to the reptiles which are poisonous or otherwise dangerous. For instance, the Adder, which is the only British reptile that is provided with a poison fang, is no more dreaded in our Island than the innocent Slow-worm. The like feeling is experienced in handling a common Earth-worm. There is a decided sensation of clammy coldness when the hand comes into contact even with this animal, and this disagreeable feeling makes one instinctively shrink from the writhing body. However elegant the student's eye may deem a reptile's form, the fact remains that ordinary human

beings look upon all creeping things with pronounced suspicion and dislike.

In the case of amphibians this repugnance is not so evident, at least so far as regards those found in the British Isles. Most of our indigenous amphibians secure a degree of patronage that is not conceded to any of our native Snakes. It is not unusual to see Newts kept as pets, but the reverse is the case as regards any creature that crawls. Yet there are some observers who venture to keep reptiles in a vivarium, and find great interest in the study of their captives. Toads and Frogs are treated with not a little consideration even by the schoolboy, but any Snake crossing his path has a stone hurled at its glittering frame.

Yet there is a place for all the members of our native fauna. It is an open question if the continual warfare that is waged against the crawling reptile, and in a lesser degree the Newts and other amphibians, tends to the good of the immediate districts concerned. The slaughter of a Grass Snake is not of itself likely to cause an upheaval in Nature's realm, nor will the tragic death of a Natterjack prove adverse to the locality where its body lies. It is when it comes to indiscriminate killing that Nature is outraged. Persecution is one of the main reasons why certain animals are found in specially selected localities. It is this that causes the Viper and its kind to hide in remote places. Toads and frogs are in a sense tolerated, and hence they are found close to man and his civilization. Were the decree to go forth that the same treat-

ment was to be meted out to Toads and Frogs which presently holds good in the case of creeping reptiles, it would be either a matter of extermination, or a gradual retreat of the Toads and Frogs to a place of safety. While the miniature serpents of our land are hiding in unfrequented paths, the favoured few of our amphibians croak just outside our city walls. Thus the reptiles hide from their enemies, as outlaws, in remote situations, while we have the Toads and Frogs practically at our doors. Between these two extremes the Newts, which are the kindred of both, inhabit the middle regions. This is true in a general sense, although each and all overlap the zones named, at times. In a broad survey, however, it will be seen that there are three great divisions, the most remote being that occupied by the creatures against whom man's wrath is constant.

No wild animal can compete with man once he pronounces its death-warrant. No creature of the moors or hedges can vie with the trapper's arts. The gun of the gamekeeper is a mighty weapon; it can make or mar a landscape. But Nature, apart from man, works out its daily round and common task in simplicity; it is the intervention of man and his arts that upsets Nature's balance. Food is the first, climate the second, and general environment the third factor in the distribution of the British fauna. Given food, an animal will face rigorous climatic conditions; given genial air-currents, it will adapt itself to extraneous circumstances; given freedom and peacefulness, it will live out its days

and perpetuate its species. Reptiles as a whole have no peace where men congregate, hence these creatures dwell in curious places remote from cities. It is natural for the eye and mind to feel refreshed when the face of the earth is clothed anew in the springtime of the year; as one notes the emerald colouring gradually creep over the fields, he is apt to imagine that all things are new. Yet every seed that breaks the earth's surface is but the kernel of the past. Even the Reptile and the Bat retain through winter's cold the mysterious vital spark until the warm sun lends them energy for another spell of active life.

It is during the springtime that Nature adorns herself for the banquet of summer. The tiny Sticklebacks in the ditch assume vivid colours, while the Heron on the watch for these finny denizens has its crest renewed and its lappets refurnished as the waters wash against its bony legs. In the rock-pools the Crested Newt assumes its helmet, and its body takes on its rouge and crimson spots when the sun stands in the heavens. In the deeper waters, where the crystal flow babbles over the pebbly bottom, the yellow Trout gets dappled with finer spots, and the Salmon looks more silvery, even when lying dead upon the bank. It is then that the Lizard gains the metallic colouring on its throat-pouches.

The ponds and ditches give correct records of the atmospheric conditions. A cold east wind sends the Sticklebacks under the débris, and the brown Trout

Photo by A. R. Thompson.

Common Lizard (Male and Female).

lies idly beneath the projecting bank. If the weather be mild in late March, the fishes come out into the channel and search eagerly for food. Then the blackish-coloured eggs of the Frog may be seen aimlessly moving with the swaying reeds and aquatic vegetation. Examined closely, these clusters of transparent balls will reveal bright beady dots—the embryos of the Frog-Tadpoles. Where the Tadpole hatches out, life is active, energetic, pregnant, and full of interest. Even while the gorse and broom are being painted in yellow upon the bank-sides and across the commons, the aquatic denizens are struggling for existence. Every pool shields not only the Tadpole, but its enemies. These aquatic poachers lie in wait amongst the vegetation, keen to catch any defenceless creature within their area. Such waterside birds as the Coot, Dipper, or Moorhen, seldom reject such a dainty morsel as an immature Frog. Even should the Tadpole evade capture during its early days, when it issues forth as a tiny Frog among the grass some dewy evening it may be picked up by some prowling Heron. This bird is a most voracious feeder, and is accountable for the death of many a Frog, even before that creature leaves the water. Eels, Shrews, Toads, Newts, Water-Voles, even Grey Rats, and many more, all fall victims more or less to this gaunt bird of the brookside and tree-top.

CHAPTER II

BRITISH REPTILES: LIZARDS

To the uninitiated observer a reptile is a serpent or a creature that crawls upon its belly, and is commonly accounted legless. A reptile is a cold-blooded vertebrate having scales or plates over its body in place of fur or feather as in other animals. It breathes by lungs throughout life. The existence of legs is not a sufficient distinction between what is and what is not a reptile. By way of illustration, the student may take the British Slow-worm, and find that the creature resembles a serpent to all outside appearance. Yet this appearance is somewhat misleading. Scientific classification decrees that the Slow-worm (or Blind-worm, as it is sometimes termed) is nothing more than a legless example of a Lizard, and is comparable with the so-called "Glass Snakes" of South-Eastern Europe and America. Although externally exhibiting no signs of legs, the Slow-worm has within its skin the rudiments of these organs. The eyes also give further evidence of its affinity to the Lizard. These are furnished with movable eyelids, a phenomenon which does not occur amongst the true Snakes. There are other minor details that uphold this scientific classification which need not be specially referred to here. It is, however, rather curious to note that the Slow-worm casts its skin after the manner of snakes; yet this fact does not

in any way place it within the realms of snakedom. Thus it will be seen that external appearance is often of little value when it comes to actually placing an animal under its specific heading.

British reptiles are represented by eight species. These are the Slow-worm, Viviparous, Sand, Green, and Wall Lizards, and the Smooth Snake, Ringed Snake, and Adder. These eight animals possess certain common and peculiar characteristics that link them together as being all of one class. The fewness of the British reptiles becomes the more noticeable when we remember that there are nearly 4,000 different reptiles in the world, of which nearly 2,000 are Lizards.

The Slow-worm (*Anguis fragilis*, Plate I.).

This is found all over the mainland of our Island, but does not seem to be indigenous to Ireland. As a rule our reptiles are seldom seen early or late in the year, and perhaps the Slow-worm appears first, and is seen later than the other seven enumerated. It is what is termed "ovoviviparous," which means that it brings forth its young alive. The number may range from six to twice that number at a time.

This reptile on being touched has the faculty of stiffening its whole body, and if roughly handled a portion of its tail will break off. This deleted portion can be replaced by a fresh growth, more or less a replica of the original.

The adult Slow-worm dines on small Slugs, Worms,

etc. It is a reptile of 10 inches to 12 inches in length, and the general outline is cylindrical, gradually diminishing in circumference towards the tail. The latter is practically as long as the body, and terminates rather abruptly. The whole body is covered with minute and finely rounded, close-fitting scales. The tongue is notched at the tip, and the teeth are somewhat hooked.

At birth the young are dull white in colour, becoming light sable-grey with age. A dark streak runs down the back. As they mature, the colour of the upper parts becomes more distinct and takes on a metallic sheen. A number of parallel rows of dark spots extend along the ridge of the back and sides at this stage. Beneath, the colour is whitish, overspread with a bluish lustre.

I recall my first acquaintance as a budding naturalist with this reptile. I had read of the Slow-worm in text-books and elsewhere, but so far I had never seen the reptile in the flesh. I had been trout-fishing from early morning, and had sat down to enjoy my lunch. As I munched my dry biscuit and cheese, I idly observed a big worm (as I then thought) cross over the adjacent bank. Instinctively I followed, to find the animal coiled upon the edge of the grassy footpath. At the time, I confess, I was at a loss to identify the species, and with (I am afraid) special precautions I reconnoitred the situation. As I did so, I was rather surprised that the creature appeared reluctant to move. It was evidently unconscious of my presence. I pushed

the end of my rod against its body, when it immediately glided away amongst the ranker vegetation. As it moved off I renewed my efforts to locate it, but that first Slow-worm I never saw again. Had I caught it, no doubt the creature would simply have "left its tail behind it" in the orthodox manner of its species.

In certain districts the Slow-worm is known as the Blind-worm. The latter designation may be traced to the fact that the eyes are small and not readily observed; or it may be accounted for by the fact that when dead the animal's inconspicuous eyes are hidden by their lids. Yet close examination proves that these optics are quite clear and sufficient for their purpose.

As a rule, Slow-worms are located upon dry gravelly soils, open heaths, airy moors, and old meadows. They seem to object to dampness in any form, and love to bask upon sandy slopes, and this characteristic is generally observable in the females during the breeding season. Once the direct rays of the sun have crossed the uplands, the Slow-worm goes out to forage. When it secures a worm, it slowly sucks the same, and ultimately swallows the morsel. Both insect and slug are treated in the same way. The Slow-worm, even while hunting, loves to have a retreat in case of danger. A stone heap or a bed of dense vegetation provides this security, and to such quarters the Slow-worm retreats when danger threatens.

Although the young are generally brought forth in late summer or early autumn, the Slow-worm is usually in its winter-quarters before that season is actually

written on the calendar. In late October, for instance, the creature may be unearthed from any rubbish heap, where it has gone to sleep, or it may be rudely uncovered by the roadman's spade from his pile of road metal. At other times the hibernating Slow-worm may be found in some crevice of the bank-side or a rabbit-burrow, absolutely oblivious to atmospheric conditions. Like Squirrels and a few other hibernating animals, the Slow-worm often issues from its winter retreat during an abnormal blink of winter sunshine, and may be seen hunting the bank-sides during the height of the day. While dormant, the circulation is tardy and the respiration is extremely low. In a sense, this hibernating means that the animal is for the time being practically dead to the world ; but the summer warmth quickens its blood, and it then awakes to renewed life.

While having the outward form of a serpent, Slow-worms have no venomous sting, nor can they injure the hand that lifts them from the ground.

In the realms of ornithology and entomology one is ever reminded how Nature has adapted its creatures to their environments. There is a charming adaptation in the nest of the Chaffinch, with its exterior decoration of lichen, the edifice resembling a miniature bulge from the tree-trunk. The Redbreast's mossy building in a mossy bank is another of the wonderful beauties painted on Nature's easel. There are millions of such marvels in every field and bank-side, every wood and pond.

The entomologist, net in hand, chases the Meadow-Brown Butterfly in the heated rays of the sun. This common insect drops amid the grasses, and the eye fails to note its anchorage. A Red Admiral dances around a patch of stinging-nettles, settles, shuts its wings, and is unseen. The Wasp, moving deftly over the broom bank, is a mere dot on the wing; once it rests, its individuality is scarcely noticed. The same with the Aphis on the rose-leaf once it falls to the gravel-path, and the same with the Spider brushed from the corner of the greenhouse.

From whatever point of view one looks at Nature, he has to confess that it has made provision for its offspring. Nature not only creates, but protects. The Slow-worm that lies idly upon the cart-track, with the sun beating down upon its elongated body, is protected even in its apparent helplessness. As the creature glides from place to place, the friendly fern-fronds drop into their accustomed grooves, the grass-blades bend and sway backwards, and all things conspire to cover the track of this legless Lizard.

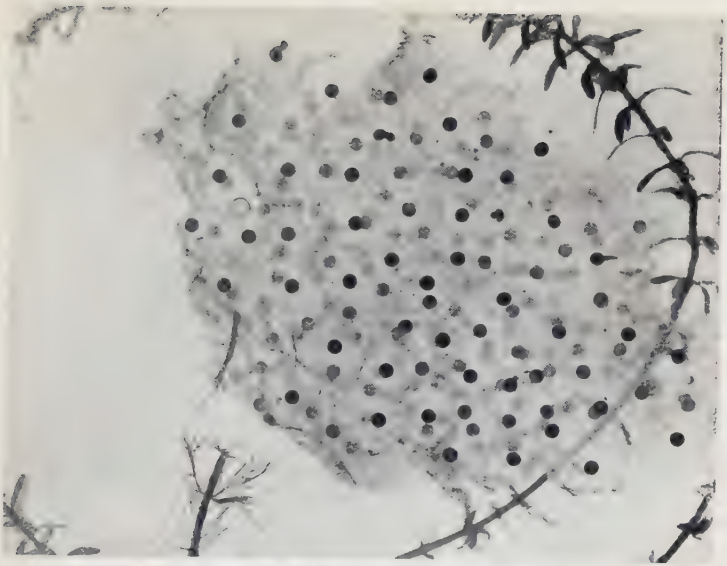
As a rule the Slow-worm basks in sunny places. Some say it sleeps at such hours, and only hunts in the evenings, when the dew is on the grasses. There is some truth in the belief, for Slow-worms do bask in the sun; a low temperature sends them under stones or other débris. There is a tendency in all reptiles to shun coldness in any form, and hence it follows that it is useless hunting for Slow-worms in the heat of a July

noon. Provided, however, that these creatures are known to frequent a given locality, a search under stones or other débris during the cooler hours of the day may be undertaken with some success. Yet it must be allowed that Slow-worms are not easily detected, as they have the facility of remaining quite motionless in the presence of surprise or danger.

Some few years ago Slow-worms were reported to be very numerous in a certain locality on the borders of England and Scotland, and the author made it a point to visit this district in view of identifying *Anguis fragilis*, as scientists name this reptile. For some days our party searched every bank and meadow in vain. We had our quarters in the village inn, and one evening, while in conversation with the landlord, a man, evidently a tradesman, remarked : " If you want Slow-worms, try the parson's meadow."

Very little more was said, but our party was early astir next morning hunting the rector's grounds for Slow-worms. Our search proved fruitless. As we dined, the man of the preceding evening's conversation passed the window. I knew him at once, and called out that we had failed to get a single Slow-worm about the rector's grounds. From the street he informed me he would bring me a few on his return to the village, and he did so. This worthy brought four alive in a handkerchief to the inn during the afternoon, which he had caught upon the very ground our party had been over some hours before.

(1)



(2)

(1) Frog Spawn soon after being laid. (*Natural size.*)

(2) Same Spawn photographed three days later, showing development of Tadpoles. (*Natural size.*)

We invited this hunter to supper at the inn, but he declined to dine in what he termed "a hotel." If it was all the same to us, he would call during the evening and partake of light refreshments, we were made to understand. Later that day we learned "light refreshments" meant "four beers."

From his conversation it appeared he was the village slater—not a very steady or remunerative job, one might surmise, in a rural village; but at odd times he undertook the duties of grave-digger, stableman, and scavenger of the village. He was a curious compound of fact and fancy. If this man had had even an ordinary school-board education, he might have attained a high place in life; a University training would certainly have fitted him for a professorship. He was perhaps the most extraordinary individual I ever met, considering his sphere in life. He was somewhat of a geologist, botanist, zoologist, and historian, and a naturalist in the broadest sense. He had had no training in any branch of science, only an innate love for Nature formed the basis of all his acquired knowledge.

We engaged him to hunt for Slow-worms the following day. He was at the inn door an hour before we had breakfast, and sat outside the door in the same fashion as if he were engaged for a grouse-drive. Before we started we offered him a glass of beer, knowing his love for this beverage. He declined, as he changed his oaken staff from one hand to the other. "I never

taste liquor afore evening," he remarked. We naturally commended his principles, and then strolled leisurely down the village street. We had followed our guide, and had walked nearly two miles, when our friend stepped over the fence and stalked energetically up a steep embankment. There was the rectory, just beyond the hill. When we reached the crest our guide gave us a lecture on Roman forts, indicating that we stood in the centre of one of these ancient landmarks. Cutting a twig from an adjacent beech-tree, this worthy led us towards a heap of stones which seemed to be the débris from the arable land beyond. He probed this heap for a time in vain, but after a while the head of a Slow-worm appeared, only to be withdrawn. Still he probed with his rude wand, and we were ultimately rewarded by seeing no fewer than eight Slow-worms glide out into the neighbouring vegetation. My companions secured seven of the eight, three full-grown specimens and four about half matured.

From this place he led us towards a farm, with fields lying beneath it, on a southern slope. A rude cartway led from this homestead down into the valley, where we could see a stream cross the county. He halted as we neared the farmsteading, and at a gravel-quarry turned sharp off, probing the loose stones with his staff. Nothing resulted from this, however, and our party marched down the cart-track. We had not gone fifty yards when our guide lifted a dozing Slow-worm,

and allowed it to twine round his fingers in friendly fashion. He told us all Lizards should be allowed the same freedom, otherwise they would let their tails drop off.

This latter capture I conveyed to town, and fed it upon the ordinary grey slugs found in gardens, and it lived through the summer. During that time I gave it a dish of water and sometimes milk, both of which it seemed to relish. One day I found it enjoying a bath in the saucer of milk. My pet never awoke from its winter sleep.

Lizards as a rule own two pairs of limbs, as is the case with Toads and Frogs. The Slow-worm, with its legless, snakelike form, is an exception. Most Lizards have movable eyelids, and this is a feature which is not present in true snakes. The bodies of Lizards are covered with scales; in size and shape they are extremely varied, and the variations extend especially to the limbs, tail, tongue, and skin. Quite a number are terrestrial in habit, while some are semi-aquatic. In food habits Lizards are as varied as it is possible to conceive; some are vegetarian, others are insectivorous, and still others prefer worms, fledglings, and even mammals. Their variations in size and structure are exquisite adaptations to their surroundings. Some are adapted for climbing, and there are fast-running and even flying forms; others are built for a life beneath the earth's surface, where they live after the manner of

Earth-worms. The digestive tract is adapted to the food habit, the flesh-eating Lizards having short intestines, while in the vegetable feeders the intestine is relatively long. There is also a great variety of coloration among these creatures. Lizards that dwell in warm quarters, where the sun parches the soil and withers the green blades, are usually a warm brown or faint red in hue, while succulent vegetation usually shelters intense or brilliantly coloured examples. This blending of the colour of an animal with the colour of its habitat is undoubtedly protective, and is common throughout Nature. The Pallas Sand Grouse from Asia Minor and the East, that dwells in sandy wastes and loves the soil of the Steppes of Tartary, is of a pale yellow colour, in keeping with its natural environment. The Yellow Hammer sitting on a furze bush is a homely example of adaptation, the Water Rail moving through the reedy swamp another. A Toad leaping over the lawn in the evening hour rests by the lilac-tree, and the eye fails to detect its presence. In the garden and the field, in the waste lands and on the hill-face, Nature protects and is protected.

Viviparous Lizard (*Lacerta vivipara*, Plate II.).

As a student and collector of natural objects, my mind can "hark back," as fox-hunters say, to a May morning when the Whinchats and a few Redstarts had taken up residence in our garden policies. Although within a month of midsummer, the trees looked gloomy

GREEN LIZARDS (*Lacerta viridis*).

and the beech hedge that led to the kitchen-garden was still bare of foliage. That year it was late in May before we heard the Cuckoo in our woods, and the season was spoken of as a backward one by Hodge and his servants. But when the first Wood-Warbler was seen in the garden, some days of warm sunshine intervened, and the Viviparous Lizard dozing on the sandy bank told of summer as truly as the Martins at the sand-pit. For some days a few White Butterflies danced about the garden, and someone said they had heard the loud screaming note of the Swift near the church tower. The Spotted Flycatchers arrived before the month passed, and the Whitethroat built its little domicile in the wood behind the garden fence. Yet May continued wild, with wet, windy weather, confirming that old Scottish admonition:

"Ne'er change a cloot
Till May be oot."

Uncongenial although the season was, the Viviparous Lizard had come out from its cranny in the rock garden, and rested under a canopy formed by the dead fern fronds of a past year.

This Lizard is frequently termed "Common Lizard," from the fact that its distribution is perhaps the most extensive of all our native species. While I say this, it must be remembered that Lizards are not common in the sense one would speak of many other creatures of the wild. The naturalist uses the word "common"

with a lavishness that is often somewhat misleading. For instance, Rabbits, Partridges, or House-Flies are spoken of and may be acknowledged as truly common in their respective habitats ; but in applying the word to any or all of the species of Lizards indigenous to the British Isles, it is somewhat of a misnomer.

Strictly speaking, Lizards are not common. They are more common in some quarters than others, and hence might be more correctly spoken of as local. Taking into account the extent of land embraced within our sea-girt isles, Lizards occupy but a very tiny portion, and that in a very patchy pattern. One may travel many miles without seeing a Lizard of any kind. This feature, of course, holds good in other respects when one comes to consider the distribution of many members of our home fauna. One must ascend the higher hills of the North to flush the Ptarmigan or the Snow Bunting. The Red Deer shun the lands where plough and harrow change the colours of the landscape ; Marten and Wild Cat are only dwellers where the silence of day and night obtains. And yet, while this is generally the case as regards the fauna of Britain, individually considered, there are many marked examples of the reverse. The Brown Hare scarcely acknowledges any boundary limit, while the Mole tunnels the soil of every county. Rooks, Starlings, and others annually build their nests from the edge of the Atlantic Ocean to the North Sea's margin. Neither pen nor pencil can tell, in figures, of the insect hatchings by stream or brook in

Sussex or Caithness, erasing for the time the waterways between.

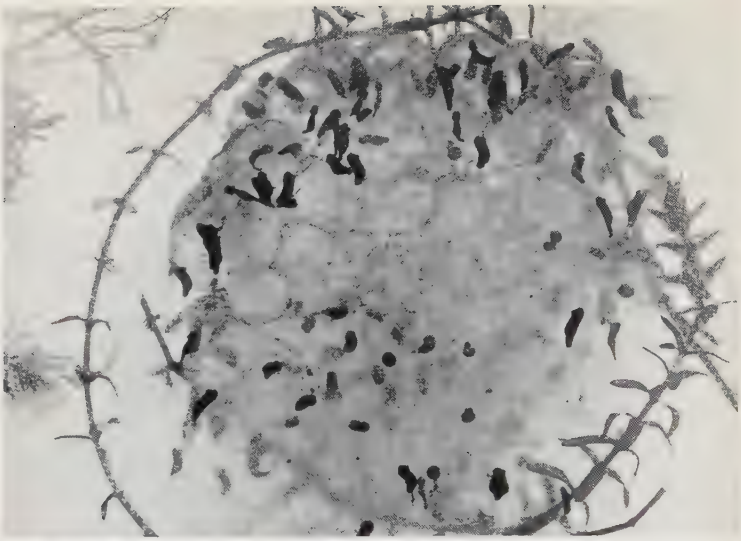
But while these and other instances may thus be quoted, the position is entirely altered where many species are concerned. In naming the Brown Hare as abundant over the length and breadth of Britain, one has only to think of its compeer the Blue Hare, which is absolutely confined to the higher heather-lands. The Golden Eagle declines to dwell where the Tree-Creeper hunts for insects, or where the Linnet sings a-top the gorse-bush. It is only upon the surface of the loch that the diver Ducks pass their days ; only by that same loch are many rare insects found. Thus, while each individual species lives under its own special conditions, the widely distributed species are merely the overflow in numbers that find provender and shelter over a wider space than others. Lizards come under the confined areas, and the Viviparous species is like unto its neighbours. Strange to say, this is said to be the only reptile that has taken kindly to Irish soil.

In colour this Lizard is of a uniform warm red, with tiny spots alternately light and dark. Underneath, the male has a rich orange hue with well-defined black spots. In the female the under parts are yellowish, touched with a few black markings. Broadly speaking, this reptile prefers dry bank-sides, open pastures, and grass-lands to shady places. It certainly courts sandy hillsides and such exposed areas rather than low-lying, damp ground. During the midsummer

heat the Viviparous Lizard may be observed basking in the sun's rays in such chosen localities, and only moving now and again to snap some unwary blue-bottle, or other fly, that may alight within easy distance. Although all sorts and conditions of insects are devoured greedily in their season by this Lizard, Nature appears to have been very lavish in arranging its larder. Beetles, Flies of every kind, Caterpillars, Moths, Butterflies, etc., all go to form enticing food for this creature. It is agile in all its movements, and a keen eye is requisite to detect it when it is hunting for food. It also calls for a very active hand to catch the darting reptile and keep the little body uninjured within its grasp. He who would capture this reptile must be careful to grasp it by the forepart of the body ; if he seizes it by the tail, he will probably be chagrined in finding a portion of that appendage in his hand while the unabashed lizard scutters away to a safe hiding-place. Like the Slow-worm and other Lizards, this species readily parts with its tail, the loss of which is repaired in time.

Reproduction takes place after the manner of the Adder. The young issue from the eggs immediately on their emergence from the parent's body. The thin membrane that encases the egg bursts, and the young are thus really born alive. The young are fully developed, and, having the full use of their limbs at birth, they can follow their parents. Instinctively these youngsters catch insects on their own account as soon as they are born.

(1)



(2)

(1) Same Frog Spawn photographed three days later still. Further developments of Tadpoles.

(2) Same Spawn photographed a day later ; a few of the Tadpoles are seen escaping from the gelatinous mass in which they had been enclosed

There are divers stories that appear periodically anent the parent Lizard swallowing these youngsters during a season of danger, but these must be taken *cum grano salis*. The same is said of the adult Adder. No really authentic instance of such actually taking place has so far been recorded, although it must be granted some rather striking and curious stories of both Lizards and Adders hiding their young after this fashion have been given from time to time. Whether the female Lizard here named takes a truly parental care of her offspring or not, certain it is the young Lizards do their own hunting the moment they issue into the world.

The adult Viviparous Lizard measures $5\frac{1}{2}$ to 6 inches in length. The tail is long in proportion to the body. It is somewhat heavy for half its length, but the remainder of its body gradually tapers towards the extremity. There are no teeth in the palate. The temple is covered with minute polygonal plates, having a rather large one in the centre. The scales over the back are long, narrow, and hexagonal in shape. The head is rather depressed and sharp ; belly plates are in six rows, with smaller ones towards the edge. The forelegs are set well towards the head, while the hind ones occupy two-thirds of the sides.

It is said that the Viviparous Lizard is never found where the Sand Lizard (*Lacerta agilis*) abounds, and this phenomenon is due to the fact that the latter hunts and eats the young of the former if they stray into its

haunts. *L. vivipara* is thus compelled to seek an environment which is distasteful to *L. agilis*.

Sand Lizard (*Lacerta agilis*, Plate VII.).

For many years this species was confounded with the Viviparous, or common species. The Sand Lizard savours of the sands, no doubt, and hence its popular name. Seldom or never is it found in mountainous districts, although quite a number of the higher ranges of hills seem quite inviting as a habitat. However, the Sand Lizard really has a very limited area, and, in Britain, would appear to be solely confined to Southern England. Even in such counties as Surrey and Dorset, with perhaps the adjacent counties, its distribution is extremely local. It is found in Southern Sweden and is common in suitable habitats in Central Europe.

Having said this, it is quite evident that the appearance of the Sand Lizard north of the Midlands would be "copy" for the morning newspapers; and if found north of the Tweed, still more "copy" would likely be made of the "find."

Yet not a few instances of this reptile having been identified north of London are on record. Students, however, have questioned such statements, affirming that these records refer merely to large, light brown coloured specimens of the common or Viviparous species. And doubtless it is so. The Viviparous species is by no means unlike the Sand Lizard, only the latter is larger, and its colours lend themselves

to make the problem of distinction more acute, especially when it comes to naming a specimen from a casual glance. So far as scientists have discovered, the Viviparous species is not confined to any special or defined locality within our mainland, whereas the Sand Lizard seems rigidly confined to mid-England and the southern counties.

In length the Sand Lizard is from 7 to 9 inches. It has a shortish head and blunt nose. The scales over the back are angular and well keeled. The tail is rather heavy looking, and is about half as long again as the head and body; fore-legs almost a quarter as long as the body, and the hind ones half as long. The upper parts are coloured olive brown, with faint green colouring underneath, usually marked with black dots. The male is usually of a more intense green than the female, but both are marked with dark spots and blotches. The female as a rule has three rows of dull brown spots along the sides, and these spots look fainter towards their centre.

The young are generally pale brown on the upper portions, with lighter spots. The latter are duller in tint towards their margins. On the under parts a uniform grey or white prevails. These youngsters are hatched from eggs, which thus makes the species oviparous. The eggs are deposited in midsummer in some sandy bed, and left to the atmospheric influences of the season. Like other reptiles, this species sleeps during the colder months of the year.

It is occasionally surmised and recorded that there are two varieties of the Sand Lizard indigenous to our island. However, any small difference in character arises simply from the local colouring.

An outstanding feature of the Sand Lizard is its love for burrowing in the loose soil it frequents. This animal is seldom seen in dull weather, but under clear skies and during sunny blinks it may be observed resting on some open heath, or benty links. In such situations it reproduces its kind, and there it sleeps its wintry days away. Sand, sunshine, and silence suit the Sand Lizard and its offspring. It feeds on almost all kinds of insects, and itself affords a favourite meal for the Smooth Snake, and perhaps other Snakes as well.

It is an essential part of Nature's plan that one creature must give up its life to sustain another. The tender grass blade, the acorn lying in the plantation, the root-crop afield, all mature for the benefit of the creatures around. As the Rabbit sits nibbling the tender shoot of a wheat-ear, the Stoat leaps from the furrow, and a brief struggle yields the Stoat a meal. The Reed Bunting is singing upon a bare arm of a dead larch, when the Sparrow Hawk sails down the field border. A swoop, and then the Hawk dines upon the little carcass by the tree-stem; a few feathers flutter in the summer breeze, and as you pass you note these as silent witnesses of a tragedy. Such dramas are ever being enacted mid the vegetation growing on bank and field, in sea, pond and stream.

Besides Snakes, there are other natural enemies of this and other Lizards : they have to be on their guard against the ravages of Hawks, Shrikes, and Crows ; they could not possibly have survived in the struggle for existence had they not been endowed with acute senses. They can hear the slightest sound, and have keen vision. Their security lies in quick flight, not in warfare. They are extremely nimble, and run along the ground in a jerky fashion. Their speed is due as much to an undulatory movement of the body, the ventral surface of which touches the ground, as to their legs, which are short and feeble.

Green Lizard (*Lacerta viridis*, Plate IV.)

The Green Lizard is indigenous to Central and Southern Europe, being found in the Mediterranean Countries and in the more genial parts of Germany ; but it exists in Jersey, and is thus claimed as an item in our British fauna. Time and again examples have been located upon the mainland, some of these being pretty far North. All the same, the Channel Islands must be considered the real home of this species when it is spoken of as British. Any specimens found upon the mainland may be looked upon as "escapes." In other words, these may be considered as having got free from some public or private vivarium, or are the lost property of some of the numerous dealers who cater for this class of business.

This species is comparatively large, measuring, on

the average, some 15 inches in length. Females, which have reached almost 1½ feet in length, have been recorded.

The colour over the back is usually of a uniform green, as the name denotes, although in some specimens this green takes on a warm yellow tinge. Underneath, the colouring is a decided yellow. During the breeding season the throat of the male assumes a bluish hue. In stray specimens there is sometimes a rather fine sprinkling of bright and dull colours upon the green surface of the upper parts. Another peculiar marking is the semicircular collar on the neck.

This reptile has a flattish head and rather prominent eyelids. The tail is readily defined, and tapers from the hexagonal tail scales towards a fine point. It is a difficult task to record the food of Lizards in detail, so varied is the menu. For instance, in the case of the one now named, the bill-of-fare comprises insects of almost every shape and colour, with Beetles, Worms, Snails, and indeed any "small game" that roams about the haunts of the animal.

It is an oviparous reptile. The eggs, of which there may be six or twelve, partially mature in the female during the few weeks she carries them. At maturity she deposits them, and thereafter the sun's rays hatch them out. This takes some four weeks, counting from the date they are deposited.

Green Lizards are usually found in rocky situations, about dry stone walls or similar places, and they seem

to prefer the security of such to the open meadows or heaths. The writer was some sixteen years of age when he first looked upon the graceful outlines of a Green Lizard. A boy in the second form received a parcel one day from his parents who were resident in Asia Minor. The parcel contained the carcass of a Green Lizard, and all the school wondered. The note accompanying the parcel told us boys that some thirty-seven Lizards of the same species had been caught in one day, and in our hearts we thanked ourselves we did not live in that eastern country. We pictured the risks associated with the capture of such animals, and conjured up the heroic courage requisite to the slaying of even a single Lizard. Yet this lovely creature is as innocent of harm as a Dove.

Wall Lizard (*Lacerta muralis*, Plate XIII.).

Having given the Green Lizard a place in our list, it behoves one to tender a like compliment to the Wall Lizard. As has been suggested in the previous chapter, it is simply a question whether the fauna of the Channel Islands are, or are not, to be recognized in the British list. Anyhow, both the Green and Wall Lizards are natives, not of our mainland, but the Channel Islands only. The true habitat of the one now under consideration is the countries of Southern Europe, although the borders of Germany and similarly situated countries are named as producing this species occasionally. It is said to be a common Lizard in and

around Asia Minor, and it is likewise reported as breeding in several parts of Northern Africa.

It is a small reptile, averaging some 6 to 8 inches. It is an attractively coloured and graceful little creature; the variety of colouring in different specimens, indeed, has been the means of giving some writers the notion that there exist more than one variety of Wall Lizard. The general coloration is greyish-brown over the upper parts, with dark markings here and there, overspread with a reddish-green lustre. Beneath, the parts range from white to red, many examples being yellow and others pink in colour. The young are hatched from eggs, and it is said that the period of hibernation is short, the winter sleep not being profound, for *Lacerta muralis* is sometimes seen basking on the sunny days of winter, before the time has arrived for its usual spring appearance. In regions by the Mediterranean, where this Lizard greatly abounds, there are few walls upon which specimens may not be seen running up and down in quest of insect food, or basking in the warmth of the sunshine. It possesses toes with sharp claws, which enable it to climb walls that are quite vertical; it is exceedingly nimble and moves with great speed. Its nimbleness is a means of safety, and it has the additional protection ensuing upon the manner in which its colouring blends with its usual surroundings.

The Lizards mentioned in this chapter, as well as others not indigenous to Britain, and which can be

(1)

Photo by W. B. Johnson.

Tadpoles, before appearance of hind-legs.

(2)

Photo by W. B. Johnson

Tadpole, with legs developed.

obtained from various dealers, may be kept as pets, and as such prove most interesting to their owners. In order to keep them in a healthy state it is essential that the captives should be placed in surroundings which are as near as possible a reproduction of their natural conditions. It must be remembered that these creatures delight in sunshine, so their cages should admit abundance of light and be placed where the sunlight can reach them. They like at times to retire from observation, and to meet this habit it is advisable to place stones, pieces of bark, and damp moss in the vivarium, so that they can play their game of hide-and-seek. The floor of the vivarium should be covered with earth or sand, and a drinking vessel, with water, should also be provided. The little reptiles may often be seen resting, quite composedly, in their water.

A vivarium, as the cage provided for such animals is usually termed, may be purchased, and different styles of vivaria, varying considerably in price, are on the market. But the student who is handy with tools can easily make what is required at an outlay of a few coppers. A fair-sized shallow box, to be obtained from the grocer, may readily be converted into a vivarium. Secure a box, say about 2 feet long, 18 inches wide, and 9 or 12 inches deep. One of the sides is to become the floor, and the bottom is made the back. A large portion of the wood of the bottom should be cut out and a sheet of glass be fixed into the opening thus made. The front of the vivarium should also be

glazed and provided with a glazed door. Ventilation must be attended to, and to secure this holes may be made in the ends and on the top and covered with perforated zinc. Bore a small hole, say an inch in diameter, in the top and fit over it a sliding tin door; it is through this hole that the Lizards are to be fed with flies, small grubs, and other food in which they delight. It is wise to paint the inside of the woodwork. The vivarium is improved by fitting a movable zinc tray into the floor: this tray should be a little smaller than the actual floor and be about 2 or 3 inches deep; the wood should be cut so that the tray may project through it, and to allow for this projection short legs must be fitted on the vivarium, the legs being just long enough to raise the tray clear of the table or the shelf on which the case is to be kept. A larger box may be partitioned so that two or three separate compartments are formed; in which event each compartment must have a separate glazed door, suitable ventilation, and a little door on the top for the admission of food. It must be remembered that Lizards hibernate, and it is not always easy to keep them alive through the hibernating period. The vivarium must be placed where plenty of sunshine can reach the animals.

The foreign species, which are usually kept as pets, such as the Geckos and Chameleons, require a heated vivarium, and there are simple devices whereby heating can be secured. The student who desires to keep such reptiles under observation will be well advised to study

British Reptiles: Snakes—Two Turtles

"The Vivarium: Its Construction, Arrangement and Management," by the Rev. G. C. Bateman (London: L. Upcott Gill).

CHAPTER III

BRITISH REPTILES: SNAKES—TWO TURTLES

THIRTY years ago a Scottish clergyman paid sixpence per head for all Snakes brought to him, dead or alive. It was then no unusual thing to see some labourer, after work, making his way towards the manse, with the dangling body of a Snake by his side. This clergyman kept his offer open all the year round, which meant that many of the victims secured were slaughtered in their winter sleep. He had a belief firmly rooted in his nature, that all Snakes—or any creature in the form of such—ought to be done to death. It was this belief that framed the annual offer of six pennies to all and sundry in his parish who deposited a specimen at the manse door. In his heart he prided himself on his philanthropic action, being convinced that Snakes in general were dangerous, if not actually poisonous. It was to save his people's lives that he paid for Snakes. A dead Snake could do no harm, he thought; but if allowed to live, some of his church pews might show a vacant seat. In his view, if Snakes were allowed to multiply in his parish, some plague might break out, and should such a catastrophe overtake his parish, he felt he would be

personally responsible. Hence his expenditure of money in this peculiar way.

Nature never inflicts upon a country-side a plague of Snakes, nor does it multiply obnoxious insects, unless some upheaval has taken place in the well-ordered plan of the seasons. Increases and decreases of a striking character are generally the outcome of abnormal conditions, in many instances the work of artificial interference. When the farmer's fields some years are overrun with hordes of destructive Voles, it may reasonably be surmised that the conditions under which the Voles live and increase in numbers must be more congenial than in an average year. The same deduction might be made in other visitations of a like nature. When a superabundance of Voles exists in any one year, there, too, the Kestrel Hawks gather themselves together. The desire for food is their talisman. When a creature secures a sufficient quantity of food, its own race increases relatively. The succeeding year finds a larger number, which demand more food, and thus the balance of field-life is being constantly adjusted. It may be, as is often asserted, that the game preserver has killed off many of the mammals and birds that help to keep that balance true; but of this there is no doubt, if Nature was left undisturbed, fewer records of Vole plagues or abnormally large numbers of Snakes would be written.

The extermination of many mammals and birds that formerly inhabited the British Isles was the result of a

1. Sand Lizard (*Lacerta agilis*).
2. Smooth Snake (*Coronella Austriaca*).

changing—gradual in its application and execution—of conditions. It was no single-handed work that killed off the Wolf, or sent the Bittern to Continental quarters. As man cut down the forests and opened the land-spaces, by the aid of plough and sickle, the Wolf sheered behind the remnant of a fading security. At the outer rim he perished. In more recent times the haunts of the Bittern have been invaded, and the once familiar, yet weird, call of the bird is now unknown in our marshes. Man encroached upon the birds' domains with shot and gun, and other deadly engines, and the war ended in the bird leaving our shores.

To-day the Wild Cat, Marten, and Pole-Cat stand on the verge of extermination, not because they cannot exist, but because they are denied a sanctuary. Withdraw all persecution, and these wild creatures will multiply in the British shires. They can fight their way to food, and make their own bed, but they cannot, in the nature of things, face a deadly rifle. The ingenious trap set warily for the unsuspecting roamer is beyond the reasoning powers of the mammal, and the creature gives up its life to the cunning of man. Of all wild mammals indigenous to these islands, the true Wild Cat deserves preservation, even where game abounds. Yet *Felis Catus* has a price put upon its head, and the newspapers placard their show-bills announcing the death of one of the remaining few. In like manner the slaughter of a Snake, however innocent that creature may be, is recorded in the

annals of the daily Press as if it were an act the reader might be thankful for. The utility of the Snake in the economy of Nature seems to call for no consideration. The withdrawal of Snakes from our landscapes would mean that their places and their work would fall upon another species of animal. Otherwise the creatures they live upon must multiply, and these in time may prove the forerunners of local, or even national, injury. On the foundation even of sentiment, our indigenous Snakes might be conserved. In the past the nation has lost not a little of its patrimony; to-day higher education might guard the innocent reptile crawling through the grasses.

The paucity of the reptilian fauna of Britain has already been referred to, and it becomes the more evident when we realize that, of over 1,700 species of snakes that are found in the world, only three species have a home in Britain.

THE SMOOTH SNAKE (*Coronella austriaca*, Plate VII.).

This Snake is found in Britain only in the more southern counties of England; its range extends over most of temperate Europe to Asia; it is common in the moutainous districts of Germany. The scales along the back are smooth, and this fact doubtless accounts for the popular name of the reptile. Underneath the plates are somewhat rounded, while the tail boasts of a double series. The tail is rather short, and well set on at the base, giving it a rather strong appearance. As regards colour, the upper parts are warm brown, with

a dull mark on the back of the head, from which again two rows of black patches extend along the body. There is also a dull mark crossing the eyes, and this again fades gradually into the neck colouring. The under portions are of a distinctly paler colour, but these colours again seem to take on divers hues, running from orange to brown, grey, and bluish-white.

The young are usually light brown over the upper regions, with a fine blue on the belly. These youngsters issue from the eggs almost immediately the latter are deposited, and it is said the parent fondly protects them until they mature. Like all their kind, young Smooth Snakes love the sunshine, and are fond of basking in its rays. While yet only the thickness of a pencil and a few inches in length, these youngsters will coil themselves in heaps over their parent's body, and sleep the sunny hours away.

As a rule the Smooth Snake has a partiality to sandy, stony, and dry localities, and its menu consists of Mice and Voles, Lizards, and similar small game. It hides in thick undergrowth and awaits the approach of its victims ; should one approach within its reach, it seizes it with a darting movement of almost incredible speed. It grips its prey by coiling round it, and slowly swallows it, head foremost. A full-grown Snake is about 24 inches in length for a female, the male being an inch or so less. Although possessing teeth in both jaws, this reptile owns no poison fangs, but, all the same, it is a demon when handled. The hand that can hold a Smooth Snake is that of an adept.

The Ringed or Grass Snake (*Tropidonotus natrix*, Plate VIII.).

This reptile is not infrequently spoken of as the Common Snake, but, although it is located in England, it does not seem to have crossed St. George's Channel; and even its appearance north of the Tweed is worthy of record.

It is an oviparous reptile, and lays some one and a half dozen eggs, or more, at a time. These eggs, which are white-shelled and nearly the size of a pigeon's egg, are usually deposited amongst fermenting material during the months of July or August, where they hatch out with the assistance of the heat of such material, aided by the warmth of the sun's rays. The eggs themselves are clubbed together by a glutinous secretion. The female on leaving them takes no further interest in their incubation, and evidently forgets about her prospective progeny. It thus happens that the young reptiles have to shift for themselves once they are hatched. And, be it said, they miss no time in going upon the warpath in quest of Slugs, Worms, etc.

Popularly speaking, this Snake is the most common of all snakes south of the Tweed. No truly defined colour or marking can be put down by way of identification of this species, as these features are so variable. As a general rule the colour may be dense olive green or a greyish-green. Beneath, the colour is usually dull or dirty white, with a few dark spots. Two

RINGED OR GRASS SNAKE (*Tropidonotus natrix*).

parallel rows of black dots extend over the back, and a few black patches occasionally adorn the sides. The average length of this reptile is about 3 feet, although it is quite a common thing to locate much larger specimens. In most instances—whatever be the length of the animal—the tail measures about a quarter of the entire length.

Although not strictly confined to marshy grounds, still Ringed Snakes have a preference for such soils. Here they love to pursue their prey, such as Frogs, Newts, or other denizens of brook and pond. In pursuit of such it is affirmed that the Ringed Snake will not hesitate to enter any minor sheet of water.*

The scales that adorn the head of this Snake are distinctive as compared with our other native species. Placed between the eyes are three plates, with larger ones beneath and smaller ones above. Over the back the scales are oval-shaped and smartly keeled, while along the sides these are larger and less distinctive in keeling. The belly plates are all single, and the under plates of the tail are set in pairs. There is a bright yellow mark, supported by some dark spots, just behind the head, which of themselves may prove a guide to the novice for purposes of identification.

This reptile, in casting its skin, has a habit of dragging itself through patches of coarse grass, and this process

* I have seen more than one large specimen of the Ringed Snake swimming at good pace near the margins of the fairly deep water-courses which drain the English fens.—Ed.

evidently aids it considerably in disencumbering itself of its disused mantle.

In keeping with other reptiles, the Ringed Snake is branded as a dangerous creature to handle, but the reverse is the case. To many people all crawling life is in a sense repulsive. The very form of a gliding snake denotes to the mind a cunning stealth that has to be guarded against. It brings with it an echo of that old-world story and the figure of that wily Serpent of the Garden of Eden.

Maligned certainly all such creatures are, but the Ringed Snake ought not to be on the list. This reptile has no poison fangs, and consequently is quite harmless; but when handled or excited it discharges a most disagreeable odour from a gland situated near the anus —one could hardly imagine any odour more offensive. Of all the Snakes, the Ringed species seems to take more out of summer than its compeers. It will be observed hunting earlier in the season than any of the other species, and it may also be seen weeks after the others have gone into the hibernating state.

This Snake has no external ears and thus is probably deficient in the sense of hearing. It has keen vision and can detect its prey at a distance by sight. Having no eyelids, each eye is protected by a transparent membrane. It is very sensitive to touch, a sense which is highly developed in the forked protrusible tongue, which can be extended through a notch in the snout even when the mouth is closed.

Unlike the Smooth Snake, which, we have seen, lies in wait for its prey, the Ringed Snake frequently creeps up to its victim and seizes it with its mouth by a rapid movement. It swallows its prey whole, and while yet alive, because it has no limbs with which to tear it to pieces. The uninitiated reader may wonder how it is possible for a Snake to swallow a Frog which is larger than its head and even thicker than its body. A study of Fig. 1 will help in the understanding of this matter.

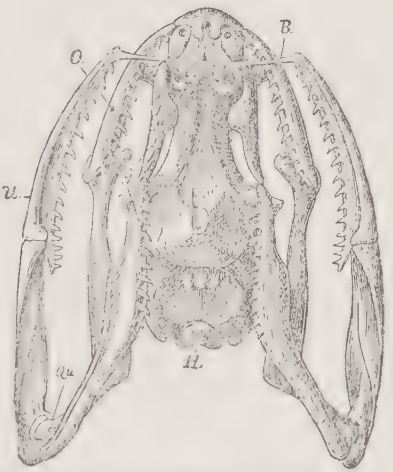


FIG. 1.—SKULL OF RINGED SNAKE: FROM BELOW.

O, Maxilla; *U*, mandible; *B*, tendinous ligament; *G*, teeth of palate; *Qu*, quadrate bone; *H*, occipital condyle.

(From Schmeil's "Text-Book of Zoology.")

The bones of the jaws are movable; they are united by means of tendinous ligaments which stretch, and when the Snake is swallowing its victim the bones become widely separated, and the head temporarily loses its normal shape. The teeth on the jaws and palate are directed backwards, like hooks, rendering escape of the live prey practically impossible. Under such conditions the process of swallowing is slow; but it is considerably assisted by an abundant secretion of

saliva. And when the food is swallowed, the body of the Snake can accommodate itself to its bulk owing to the arrangement of the ribs, which are not joined to a breast-bone on the ventral side. The gullet, too, stretches so that food of good proportions can pass along it. The Snake is not choked during the slow act of swallowing because the breathing apparatus extends over the floor of the mouth nearly to the chin, so that breathing can take place quite easily while food is being swallowed.

It would be harmful to a man to bolt his food without mastication, but a Snake can dispense with the ordinary business of mastication, because its stomach secretes very strong digestive juices. It is well known that Snakes can endure long fasts without discomfort, and this is due to the great bulk of food which they can swallow at a single meal.

The Adder, or Viper (*Vipera berus*, Plate IX.).

Although Adders are by no means limited to any well-defined area, yet there is no doubt that the mountainous regions of northern Britain harbour more of these creatures than any other portion of our country. There is a quietness about such places that is inviting to the Adder and which it can seldom find upon the lower grounds.

Standing alone upon the higher peaks of the Grampian range when the mid-summer sun glimmers amongst the wiry heather stems, mocking the trickling stream oozing

from the corrie side, one realizes the profound stillness that pervades the landscape. There is an unbroken mantle of heat over the visible earth, with a weird whistle of a moving Plover in the glen beneath. The heather spreads outward and beyond, and miles of colour carpets the earth. There seems no boundary to the clouds, no limit seems to be mapped out for the earth. Both above and beneath, the aspect is boundless, with the greater world unseen, beyond. A Dragon-Fly dashes across the slope, and the movement of its gaudy wings in the sunlight almost intensifies the sultry heat.

Out from a withered rootlet glides an Adder, the sun glittering upon its polished scales. The creature raises its head as if it scented the presence of its observer. Then with a swanlike movement it lowers its head, pushes a fern frond aside, and glides towards a bare sandy hillock. Here it coils itself up leisurely in the face of the fierce sun. At a distance it looks like an igneous rock peering from the parched earth.

The general colouring in Adders is brown or olive, fading into deep brown or black. These ground colours are inclined to alter according to the environs, although the more distinctive markings are always present. Some observers have surmised that there are two species of Adders, because of the diversity in colouring. The scales of the head are small and numerous. Over these scales there is a black patch which takes on a rather curious form that with a little imagination has been likened by some naturalists to a skull and cross-bones.

There is also a small spot on either side of the base of the head. A wavy line passes along the whole length of the body and tail. Microscopic examination proves this line to be a series of dark spots blended into what looks to the naked eye as a distinct and continuous stretch of colours.

Adders are ovoviviparous. The thin membrane that encloses the egg ruptures during the process of parturition, and the young immediately escape. There are ten or twelve at a birth. Before the female deposits her eggs she lies about in sunny positions in a sluggish and inactive manner. This exposure of the body to the direct rays of the sun is said to be helpful, if not essential, to the development of the eggs. At birth the young are as vigorous and pugnacious as their parents, only less harmful. During the active or summer season the Adder casts its skin, and not infrequently this operation is repeated before the date of hibernation. As a rule the Adder sleeps in solitary state during the colder months of the year. Instances are quoted, however, of several being found coiled together in a single hole.

Adders are reputed as being able to swallow or hide their young in their mouths during a season of danger. No theme in local natural history realms has given rise to so much discussion as this. Some naturalists assert that it is quite impossible for the parent to hide her offspring in this fashion, while an equal number of observers declare they have watched the operation, and

emphatically assert that their eyes could not deceive them. The writer has often seen whole families scouring the heathery slopes of the mountains, and even in the presence of the gravest danger from man and dog, no instance of the parent Adder inviting its offspring within its jaws was ever noticed. I once saw a schoolboy chase and kill no fewer than seven young Adders, and although the parent was present for a time, it never exhibited the least sign of opening its jaws as a refuge for its youngsters. But while this is the case there is no doubting the fact that many close observers are confident Adders can thus protect their offspring. The question remains undecided at the moment.

Adders are dangerous. Indeed, as has already been noted when speaking of the Ringed Snake, they are the only poisonous reptiles in the British Isles. Within this creature's head there is a poison that is deadly in its action. So far, however, as human beings are concerned, no deaths are on record, although there have been many instances in which the bite of an Adder has given rise to serious apprehensions. The Adder's head is small when viewed alongside the other portions of its anatomy. It is also strikingly flat in appearance. The poison fangs are placed in the upper jaw. The lower jaw boasts of a row of teeth. The fangs fold against the gums when not in use. When the Adder is on the war-path its principal method of attack is by coiling its lithe body with the head erect but held somewhat back from the centre of the coil. In this position

it can strike with remarkable rapidity. In striking it darts its head towards its victim, the jaws close for a second, and the poison is poured into the wound. As quickly as it strikes it retreats, assuming the same position. Of course, the animal can bite as viciously without thus coiling itself, and when in pursuit of prey it often kills its quarry while on the move.

In the Highlands of Scotland dogs employed on the grouse moors or those used as sheep-dogs are sometimes bitten by Adders while at work. Doubtless such injuries are the direct result of the Adder being disturbed and alarmed by the presence of the dog, rather than of what may be termed "wanton aggressiveness." A dog that has been bitten by an Adder generally suffers acute pain for days. The writer heard a shepherd once give a very simple recipe for the bite of an Adder. He said: "Wrap the bite in Archangel Tar, and let the dog sleep." Not so very long ago, and even yet in some quarters, flockmasters in the Highlands implicitly believed that the strong scent given off by goats frightened Adders from the hill pasturages. In not a few instances it was actually stated that the goats devoured the Adders: hence some sheep-owners kept a flock of goats amongst their sheep. An old shepherd told the writer that he had often seen the goats killing the Adders with their feet and then devouring their victims. It is, however, scarcely credible that the herb-eating Billy should turn carnivorous and swallow a poisonous reptile. But

VIPER OR ADDER (*Vipera berus*).

nevertheless there is not a doubt about the statement that goats were retained on sheep-runs under the impression that Adders left the ground where goats were kept.

A full-grown Adder will measure anything up to 2 feet in length. This is what may be termed a "well-matured adult." One in my collection is exactly 23½ inches, and is about as large as any found in the district for many years.* At times, however, an abnormally large specimen is secured if reports can be implicitly relied upon.

The food-bill of the Adder is absolutely limitless. It kills and eats all kinds of small animals, and sometimes kills what it cannot swallow. Even a Slow-worm crossing the path of an Adder runs the grave risk of being added to the latter's menu-card for the day. It is a relentless reptile and a gluttonous feeder. Considering its poison fangs, Ireland is blessed beyond our mainland, for the Adder, like the harmless Ring Snake, has no abiding-place in that Emerald Isle.

It is worthy of note that the Adder is nocturnal in its pursuit of prey, and its eye, like that of the cat family, having a vertical and dilatable pupil, is well adapted to its nocturnal habits. The Ringed Snake, we have noticed, has numerous hooked teeth on its jaws and palate, and these enable the animal to retain and swallow live prey ; but the Adder is not furnished in this way, and therefore it is compelled to kill its

* I have in my possession an adder measuring fully 24 inches in length ; it was killed in the Isle of Arran in August, 1910.—Ed.

victim before eating it. So that it may do this satisfactorily it is furnished with poison fangs. Fig. 2 indicates the position of these fangs, and shows that there is a reserve fang to take the place of the one in active use should it be broken. This provision is very

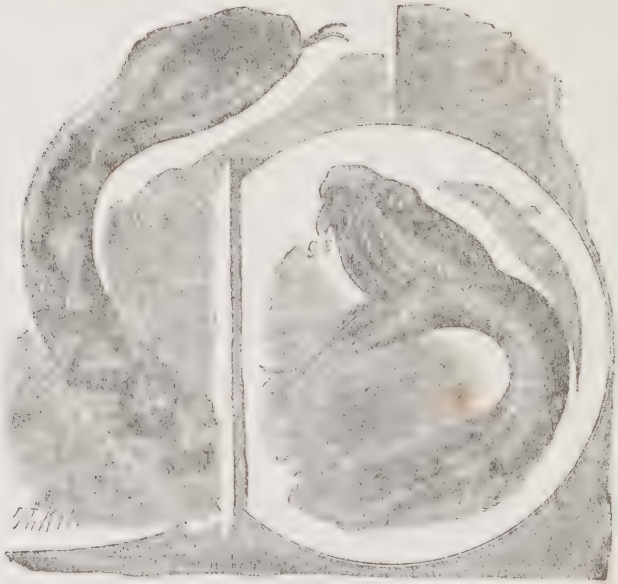


FIG. 2.—HEAD AND ANTERIOR PORTION OF THE BODY OF THE ADDER.
G, Poison fang ; *E*, reserve fang.
(From Schmeil's "Text-Book of Zoology.")

necessary because the fangs are so brittle that they are liable to breakage. These fangs are not fixed like teeth, but are in a manner hinged, so that they may lie inside folds in the mouth and thus not be in the way when food is being swallowed or when the mouth is

closed. In the act of poisoning, the fangs are erected, and, entering the flesh of the victim, act as a sort of hypodermic syringe. The pressure upon a fang causes it to press upon a gland in which the deadly poison is stored, and the latter is forced along a canal in the fang into the wound; thus the poison is injected directly into the blood.

The harmless Snakes described in this chapter make excellent pets, and I know more than one enthusiast who keep adders in captivity. The Ringed Snake is usually a great favourite with vivarium keepers, as it is easily tamed and readily accommodates itself to confinement. At first it may emit the peculiarly offensive odour to which reference has been made, but it ceases to do this when it has become used to its quarters and its captors. Being an excellent swimmer it revels in water, and should always be provided with a tank in which to bathe, the water being changed daily. A small shrub grown in the vivarium will provide the snake with climbing exercise; and it welcomes a box of material, such as broken bark, or moss, within which to hide. Perhaps the best kind of vivarium for these Snakes is a roomy four-sided glass case with a lid consisting mainly of perforated zinc.

Two Turtles.

There are two Turtles that are occasionally claimed as British, although, properly speaking, their appearance

in our quarter of the globe is purely accidental. What is known as the Hawksbill Turtle (*Chelonia imbricata*)

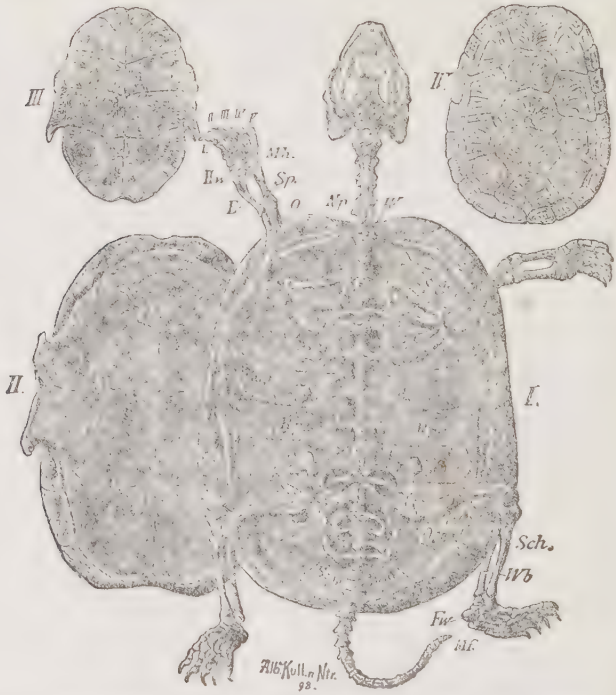
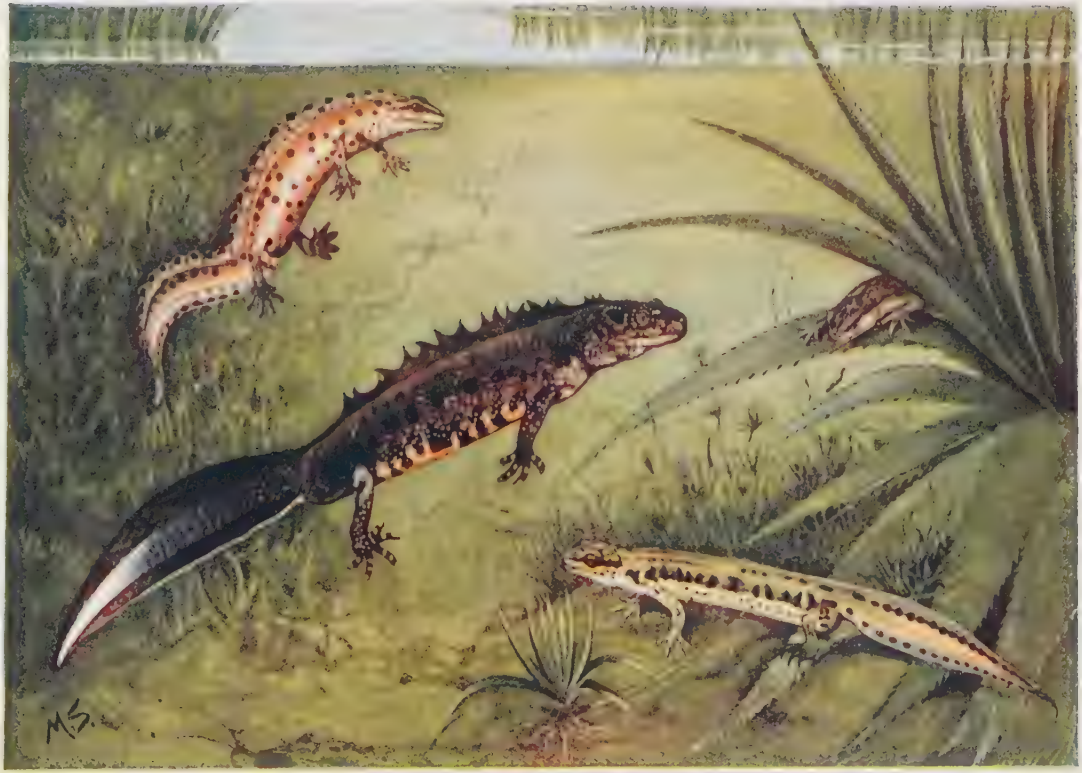


FIG. 3.—SKELETON AND BODY ARMOUR OF POND TORTOISE (*Emys Europæa*) ILLUSTRATING THE SKELETAL STRUCTURE OF THE ORDER CHELONIA TO WHICH THE TURTLES BELONG.

I., Skeleton and dorsal shield (carapace) : from below. *II.*, Ventral shield or plastron. *III.*, Plastron : from below. *IV.*, Carapace : from above.

(From Schmeil's "Text-Book of Zoology.")

lays claim to be British from the simple fact that one was caught in the Severn and lived for some few months in an inland pond. This creature is barely a



1 & 2. Smooth Newts (*Molge vulgaris*).
3. Triton or Great Warted Newt (*Molge cristata*). Spring coloration.
4. Palmated Newt (*Molge palmata*).

PLATE 10.

yard long, and covered with horny plates. The limbs are of the paddle shape ; head small but prominent ; upper jaw curved over the lower, forming a hooked beak ; shields dark brown, with light brown or yellowish margins. "Tortoiseshell," as we know it in commerce, is derived from this shell.

The other Turtle referred to has been caught several times in British waters. This one is popularly known as the "Leathery Turtle" (*Sphargis coriacea*). It is quite a ponderous creature, measuring 6 feet in length, of a dark brown colour over the back, and the tail and legs of a deep brown or black colour. There are well-defined yellow spots on the upper surface. The fore-legs are much longer than the hind ones. Naturalists assert that this leathery skinned Turtle is the only living representative of what was at one time an extensive *family* in the reptilian world. At best neither of these reptiles should be included in the British list, but are named here merely on account of the fact that they have been actually identified as vagrants—nothing more.

CHAPTER IV

BRITISH AMPHIBIANS : NEWTS

In Britain there are seven species of Amphibians. Three of these own tails and are popularly called "Newts." Four are tailless, and are known as "Toads" and "Frogs." They are what naturalists designate cold-blooded vertebrates. In most instances amphibians

(*amphi*, double ; *bios*, life) breathe by gills in the early stage of their existence, and by lungs when adults. The eggs are deposited in the water, and the Tadpoles hatched from them live a purely aquatic existence for a time. While in this stage, being provided with gills, they respire water, from which air is extracted, but in later life they develop air-breathing lungs, and so can live out of water.

The names of the seven amphibians indigenous to Britain are Great Warted Newt, Smooth Newt, Palmated Newt, Common Toad, Natterjack, Common Frog, and Edible Frog.

The Great Warted Newt (*Molge cristata*, Plate X.).

During the breeding season the male of this species is adorned with a distinctive crest, and this adornment gains for the creature the rather popular title of Great Crested Newt. This crest runs along the ridge of the back and tail, and has a serrated edge.

The name "Warted" arises from the fact that this Newt has a very warty skin, especially so towards the head and sides. A rather heavy fold of skin also crosses the throat, and the tail is very flat with acute edges. The universal colouring is dark brown, orange-brown on the upper parts, and orange underneath. Along the sides there usually are a number of white spots. In the breeding season the male alters its normal colouring somewhat, a band of silvery grey

then appearing. The creature has very bright eyes.

The abnormal colouring of the male at the breeding season is worthy of special remark: it occurs commonly among amphibians, and there are instances of it in other animals; for example, in the male Stickleback which almost bristles with colour under sexual impulse and when fighting. But it is not only during the breeding season and among males that changes of coloration occur, for a number of amphibians are able to change colour to harmonize with their surroundings; and this blending with environment is undoubtedly protective. The changes of colour are due to rearrangement of variously coloured pigments existing in minute particles in the cells of the skin. The variously coloured pigment particles are frequently huddled together in the middle of each cell, but under emotion they are, as it were, arranged, perhaps particles of one particular colour spreading over all the cells and obscuring particles of other colours. These rearrangements are not due to voluntary or conscious effort on the part of the animal, but to emotion, such as fear, anger, or sexual impulse. We know that a blush is involuntary, and that we may grow livid under anger or white with fear. The abnormal colouring of the male newt under consideration during the breeding season, like that of other animals under similar circumstances, is undoubtedly due to the ardent activity of the sexual impulse.

The breeding season varies somewhat, and while the

egg-deposits may be observed in early April in the more southern counties, it is often a month later when they occupy a place in northern waters. The eggs are spherical in form, with a whitish yolk, placed in what may be described as a "capsule." This capsule is again surrounded by a gluey substance, which Nature evidently intends as an adhesive, so that the little mass may cling to any obstacle it may happen to strike.

Like a germinating pea, these eggs swell and ultimately rupture their sheaths, and the tiny atoms float free. Thus the Tadpoles first appear, pale green in colour, with minute dark stripes over their bodies. Over the tail may be observed faint white markings that look rather pronounced as compared with the general colouring. At this stage the Tadpole owns external gills, and from its upper jaw protrudes a feeler or clinger, that enables the creature to fix upon any water-weed for support during these infantile days.

During this time the animal draws its food from the water. As becomes its own size and weight, the particles that go to the formation of its menu are minute in the keenest sense of the term. All the same, it is truly wonderful how these small Tadpoles develop. First of all the forelegs appear, and these tiny appendages are utilized for some little time. After the creature has floated about the pond for ten or twelve weeks, it gains a hinder pair of legs, and then takes definite shape as a true Newt. Once these fore and hind legs are in operation the gills atrophy, and the

Frog Tadpoles, with hind-legs developed
This stage occurs prior to that pictured on Plate 6, No. 2.

creature climbs out into the open country a full-fledged Newt. From the date when the egg with its life-germ is deposited, some six months elapse before the mature animal actually takes to land.

Once on *terra firma* the Newt alters its condition or life. For three years afterwards it ignores the water. At this time the male gains a curved crest, and then returns to its original element ready for its nuptial duties. Thereafter the creature spends something like a quarter of the year about its favourite waterway. Once the breeding season is over the male loses its serrated crest and not a little of its abnormal colouring (see p. 51). During this time the female has deposited her eggs amongst the weeds of the brook or pond, and from these another generation comes into being before the summer wanes.

The tail of the Newt—quite irrespective of its species—seems to not only be the rudder, but the propeller, while the animal is actively swimming. When it is immersed in its element the legs are kept close to the body, and the tail movements evidently force the body through the water.

Newts shed their skin periodically, and this takes place during the time they are on land. Before this change of skin is effected the general colouring becomes duller, and the more distinctive tints perceptibly fade. This "sloughing," as it is termed, is, indeed, more pronounced in these amphibians than in the case of the reptiles. Newts are intensely active creatures, and they

can throw off the old garments for new apparel with a readiness and ease that many of the reptiles cannot imitate.

Previous to the hour when this sloughing actually comes into operation, the creature exhibits signs of restlessness in one form or another. A raggedness appears about the mouth, and the Newt rubs itself against any fixed or stable object it may come into contact with. This, however, is but a stage preliminary to the change about to be effected. Once the skin actually commences to peel off, it looks as if the whole integument had actually loosened of its own accord. The animal extricates its limbs one by one, as a man would draw his arms from his overcoat, the body and tail slide out, and the whole casement floats upon the tide as a rejected mantle. Sometimes the Newt will turn and snap at its old garment, nibble at it for a little while, and maybe make a meal off it, but as a rule it allows it to drift with the current.

Apart from this peculiar characteristic in Newts, these creatures, like many of their kind, have the power of repairing any injury to their various limbs. A broken tail, for instance, can be renewed, although in most instances the new growth seldom proves a really accurate replica of the original part; but, broadly speaking, it is a very good imitation of what had previously existed.

Newts live on aquatic or other insects, Tadpoles, Worms, and any moving life found about waterways

or marshy places. It is said that amphibians as a rule refuse to eat "still life," or, in other words, decline any meal that has not the spark of life within it. Be that as it may, Newts are fond of catching their prey by the head, and without any formal ceremony swallowing their victims whole.

In some districts Newts are supposed to convene meetings in late autumn, and before they finally settle in their winter quarters for hibernating purposes. From such conventions the younger members individually retire to some hole in a clayey bank, while those of mature age form clubs of ten or twenty, and roll themselves up into a living mass, and then go to sleep. This is undoubtedly superstition run riot, yet it savours somewhat of the procedure of the Bat, and may have originated from the same.

While speaking of hibernation, it is rather curious to note that Newts can stand quite an abnormally low temperature. Generally speaking, animals that can do so do not hibernate. Doubtless the absence of insect and other life on which Newts feed compels them to retire for a season, just in the same way as the summer Bats take on a dormant state until the atmosphere is again loaded with Diptera and Lepidoptera for their sustenance.

Newts live long, bar accidents, even in captivity. How long they do live no one can say ; of such, no record has been written, although one or two observers mention twenty, thirty, or forty years.

There is certainly a continual warfare in the fields, the hedges, and woods, but the carnivorous activities are as a rule confined within a given and well-defined radius. Not so when it comes to water. Trout, for instance, will jump at a live worm or an artificial fly, a metal spoon or a tin minnow.

Quite apart from the Seal, Otter, or Pike, or indeed any other aquatic or semi-aquatic animal that is supposed to prey upon their more feeble companions, there is an element of cannibalism ever present beneath the surface of the water, be it pond, stream, or sea. Such a condition of things is quite unknown "above ground." Aquatic animals continually prey upon one another. An artificial lure under water dangled before the eye of a Trout means attack by that fish. A gilded cord wound round a few feathers will place a Salmon on the river edge, and even the slough cast off by a little Newt upstream may prove the death-warrant for a Sea-Trout fresh from the ocean. It is under such aquatic conditions that Newts are cradled.

The Great Warted Newt has a preference for clayey soils, and where water has gathered and remained undisturbed for a lengthened period such ground is generally a favourite haunt for the creature. Its presence may be detected by the appearance of the air bubbles on the placid water, which are caused by the Newt rising to the surface for breathing purposes. When thus observed it is quite easily caught by simply tossing any live bait on the end of a cord into the

water. The Newt will not hesitate to seize the dainty tit-bit and allow itself to be dragged ashore.

The Smooth Newt (*Molge vulgaris*, Plate X.).

Of the Newt family this is perhaps the most numerous. Considered in comparison with that of the species just described, the skin of *Molge vulgaris* is smooth, although there are a few pores over the top of the head and a few minor markings of a like nature along the sides. Still, these cannot be called warts, similar to those which are borne by the Great Warted Newt.

Over the back the colour is dullish grey, with lines of rather dark spots. On the head there are usually five such spots, and these reach almost to the crest. Beneath, the parts are yellow coloured and adorned with dark dots. In the male the lower edge of the tail is red, with a faint blue stripe along the side, while in the case of the female the yellow colouring takes the place of the red marking.

The eggs are deposited in a stringy film, and number anything from four to six to a cluster. These are generally found adhering to the rootlets of water-plants, or the plants themselves. The Tadpoles that hatch out are dull-looking atoms at first, with a few pale yellow dots over their tiny bodies. Beyond this, the young of the Smooth Newt is but a replica of that of the Great Warted species, in so far as its birth, growth, and general habits are concerned.

By way of diet the Smooth Newt is not over

particular. Insects, small Slugs, and Worms are equally acceptable. Generally in late September it prepares to go into its winter quarters, but as regards a site it seems to be rather fastidious in the selection. It may crawl under a heap of stones, a bunch of herbage, or a pile of lumber, but all the same this Newt seldom or never hides itself without due regard to the prospective rigours of the coming season.

Some observers affirm that the Smooth Newt loves homely quarters, and that it frequently combines with others of its kind, and—

> "Rolled up in a ball,
> In a hole snug and small,
> They sleep one and all,
> And await Nature's call."

There is a rainy season that annually precedes the coming of snow. It is then the time of withered grasses, sodden leaves, evening frosts. The frosted foliage seems abnormally limp until midday dispels the illusion. There is then a sunny glint for an hour, during which the earth turns warmer, and the far-off hills seem to come nearer, as if they had pushed their foundations into the arable regions of the shires. During that hour the heather-blooms look more purple, and the Newts may be basking in the sun. The fern and bracken are then dappled in brown and yellow, the rowans are red, the wild-rose fruit is scarlet. Over the fence there is a green fringe of cranberry foliage clinging to the brambles. Round the outskirts

of the crofter's garden are marshy bog-lands with the myrtle's yellowing leaves, and warm spikes glistening in the pale sunlight. Although the summer songsters have vanished, the wintry visitors fill the vacated places in the calendar of the year. Just when the roadway looks dry and firm after a frosty night, small parties of birds will be noted passing from lea to fallow land. They go with a hurried rush of wings and a sharp call-note. These are Greenfinches. One misses the Linnet groups that were in evidence in days gone by. These are only seen occasionally now. Fieldfares are as of yore. Later on will come the Redwings ; it must be harder frost before they arrive. The Fieldfares, often termed "hill-birds," go from the open fields up to the fir-tops, and give out harsh croaks as they fly. Birds that are ever present are the Rooks, Starlings, Robins, Thrushes. Doubtless these make tiny migrations throughout the season, but they are always represented in the shires. So, too, are the Lapwings more or less. But during this cold, bleak season, the Newts are snugly asleep. They hate cold, and it is only when spring again warms the surface of the earth that they venture from their hiding-places and renew the tenor of their way. This instinctive aversion to cold is accounted for by the fact that Newts and other amphibians are animals commonly called "cold-blooded," or of variable body-temperature. Not having any particular provision for the maintenance of heat, such as occupy temperate regions are compelled

to hibernate in the cold of winter, when the circulation of their blood is very slack.

Thus springtime sees the Smooth Newt active once more, and if the weather be congenial, this awakening is generally in March or April. Once abroad, the male assumes its crest, and this extends from head to tail. The spring coloration is more pronounced than that of other seasons of the year. The colours of the female are less pronounced.

The Smooth Newt attains a length of from 3 to 4 inches.

The Palmated Newt (*Molge palmata*, Plate X.).

Evidently this species is more widely distributed throughout Britain than is commonly surmised. It is found in Scotland, and, like all other Newts, irrespective of species, is spoken of as the Water-Esk, or simply the Esk. Wherever located, it is by no means a difficult task to fish this creature out of its element. A small net dragged through the shallows will likely land a few of these Newts if they actually frequent the place.

The hind toes of the Palmated Newt are webbed, the crest is low and straight, with the posterior portion rather more raised than the other. The tail ends in a filament over the back, in which region the coloration is olive-brown, while underneath it is lighter brown or yellow. The body is touched here and there with dull brown markings, while the head also owns several of

Photo by W. B. Johnson.

Tadpole showing tail beginning to be absorbed.

Photo by W. B. Johnson.

Toad Spawn.

these dull spots. The tail has a bluish stripe along the side in the male, with the lower edge red, while in the case of the female the latter is orange. In keeping with other Newts, the female is the larger of the sexes. A rather distinctive feature of the Palmated species is the flattened back with its raised lateral lines across the eyes, and extending the entire length of the body. Added to this is the finely formed crest that starts from the back of the neck and continues almost the whole length of the body.

Water-logged pastures where the ground retains the moisture all the year round are favourite haunts of the Palmated Newt. On one of these old commons the writer has seen as many as a dozen fished out during a few hours. In some parts of the country a common pasturage for the village cows is yet an institution, the cattle being placed under the care of a herd-boy, who tends them while at pasture, and brings them home at stated intervals during the day. This practice of rural co-partnery is gradually dying out, but at one time it was one of the most picturesque features of rural life. These commons were never touched by the plough, but carried natural grasses year after year. The earth consequently took on a crust it would not do otherwise, and in the hollow places water stood many inches deep throughout even the driest summer.

In the morning the herd-boy leisurely strolled down the village street, blowing a rude horn, to warn the natives that they must unbind their live-stock. As he

moved down the street each cow came from its shed and joined the ever-increasing herd. Slowly the kine moved instinctively towards the common, and spread over the pastures. The herd-boy would drop beside a friendly bush and fashion a whip-handle, or watch the birds and insects that flitted across his domain. Now and again he would entice the Newts from the sluggish pools, and it was while thus engaged the writer formed this herd-boy acquaintance. The boy did not know the name of the species he captured, but yet he knew how to keep them alive until he tired of them. Some days, he said, he slept for hours, and did nothing but walk to and from the village. In his herd there were four ponies and an aged horse, the latter being a pensioner. He surmised the Newts bit the latter and crippled it some days. The cows, according to his view, were never harmed, nor the ponies, only the aged mare. A week before I met him he had had to leave the horse on the common over night, and in the morning he found a dead Newt by its side, which he said the horse had killed while warding off an attack. The old horse was too frail to defend itself, I pointed out, but the herd-boy had his grandfather's word for it that Newts were deadly enemies of every living thing that was aged. As he spoke, under some poplar trees, the mare was standing idly. It looked worn-out, frail, and unable to move its stiffened joints. Hard work and the feebleness incidental to old age had made the village nag worthless as a financial asset

Its feebleness had come upon it unknown to itself, for such is the kindness of Nature. The old mare had not even the energy to move from the plague of flies that buzzed around its head. Bones and flesh fail, and energy becomes dull and languid. Even the great iron shaft of an engine gets "tired" as the years roll on. "Tired" is the word. There is no other name so expressive of frailty. The iron beam may revolve for years as a perfect piece of mechanism, and, without any visible flaw or external sign the shaft will snap in twain—"tired." The engineer, when asked for a reason why such a solid piece of metal should break without any apparent cause, can only use the word "tired." No other explanation can be given. Just so with Nature. Nature gets tired at times. Great trees will snap in the forest that are sound at heart, while "blown" timber often outrides a gale. Old age, strenuous activity, constant action, brings "tire" some day when least expected. That herd-boy's grandfather was ninety-six years of age ; I met him that same evening, and he, too, was tired. He confided in me that the best time to catch Newts was when they were pairing. He said they were tamer in disposition at such a time, and would allow anyone to approach them then. He had caught them on the common eighty years ago, as a boy, and kept them alive for several years in succession. He had even sent live specimens to London in boxes, via the mail-coach, and they had arrived safely. Of late years he

had not given Newts much attention, because he found they were "dangerous." He believed they attacked cattle, and often caused cows to retain their milk, and as a good citizen he could not conscientiously retain them about his premises. Superstition dies hard.

CHAPTER V

BRITISH AMPHIBIANS: TOADS AND FROGS

The Common Toad (*Bufo vulgaris*, Plate XVI.).

Like the stories that periodically find vent through the medium of the daily Press regarding the unexpected appearances of Sea-Serpents, stories related of the Toad have gained for that animal somewhat of a like notoriety. One reads of this creature being embedded in solid rock for centuries, or of its being liberated from the core of some monarch of the forest after untold ages. Perhaps all such stories are myths; yet, nevertheless, the Toad is a creature that has a lengthened existence, and may live to great age if accidents do not cut short its career. Many instances might be quoted to prove that the Toad lives at least the average span allotted to man himself. The writer can submit a well-authenticated example of such longevity. In a sea-coast town of Forfarshire he has repeatedly seen and handled a Toad that is owned by a gentleman who takes a special pride in his pet.

Wall Lizards (*Lacerta muralis*).

When the owner gained possession of the property he occupies, this Toad was already on the ground. It is now over fifty years since that date, and the same Toad looks as active to-day as it was when first observed. There is no room for questioning the veracity of this statement, as the writer has known these facts for many years, and seen this same Toad at all seasons of the year. This aged animal is very tame, and seems to recognize the voice of its owner. It certainly discriminates between those belonging to the family and strangers. In its own slow fashion it responds to the call of its owner, and allows itself to be freely handled. In the presence of strangers, however, it is evidently shy, and declines any overtures that may be made, even although a dainty insect be presented as a peace-offering.

To the average person a Toad is not looked upon with any degree of favour. It is considered, from its shape and general habits, to be loathsome, and what a Scot would speak of as "uncanny." This feeling in a great measure arises from prejudice. The Toad is, indeed, a very cleanly and quite harmless creature. It changes its outer garment frequently, and after such sloughing it does not by any means object to dine on its cast-off hide.

It should, however, be stated that a mucus, which does not smell pleasantly, and which is slightly poisonous, is secreted by its skin. This secretion is harmless enough under ordinary conditions, but it might not

lead to pleasant consequences were it to reach the mucous membranes of the eye or mouth. Evidently it is this secretion which induces dogs to leave Toads severely alone.

Towards the latter end of April or in the early days of May the Toad lays its eggs in the water of some pond or ditch. These eggs are extremely curious-looking objects as they are seen clinging to the aquatic weeds. Attached to the plant is a sort of double cord, somewhat transparent, inside of which are the tiny eggs. As these mature the cords swell considerably, and in some ten or twelve days the Tadpoles issue from their jelly-like covering. The newly-born Tadpoles adhere tenaciously to their floating cord for some days, but ultimately settle upon the adjacent vegetation. It will be observed that they retain their positions by the aid of a sucker beneath their throats. During the early stages of their growth they alter in outward appearance by the external gills shrinking and the hind-legs being formed. A few weeks later the fore-limbs appear, while the Tadpole tail is dispensed with. It is then that the young Toad "goes up country" and invades the pastures. From that hour the Toad is much more of a terrestrial creature as compared, say, with the Frog ; indeed, it, in future, visits water for one purpose only—*i.e.*, to deposit its spawn.

Toads are minus teeth in either jaw. They own thick, short limbs, and these are placed well up towards the head ; the hind-limbs are not adapted for leaping

as they are in the Frog. The toes are short and webbed ; the head is large, with a flat crown ; the muzzle is short and rounded, and the gape is extremely wide. The whole formation gives the animal a distinctly squattish look. Over the eyes there are small warty protuberances. The iris of the eye is red, marked with a dull mottle. The two hind-legs are quite as long as the body—*i.e.*, an average of 4 inches. In colour the Toad is dark brown above and white underneath. Both the back and belly, however, vary somewhat in different specimens. A pale brown back may often be seen, while a faint rosy tint sometimes overspreads the lighter colouring on the lower parts. The Toad provides us with a good example of protective coloration. On brown earth, when resting, it appears strangely like a lump of earth. If, however, the animal rests among green vegetation during the day, the skin assumes a greenish tint to harmonize with the green surroundings. The male is the smaller of the sexes.

For food the Toad chiefly relies on the insects, Worms, Snails, and the like, that it may find during its excursions in the mild summer evenings. Especially after rain the animal may be observed moving amongst the vegetation on the outlook for such small game. It is most active at night when the dew has settled or during damp days ; it avoids glaring sunshine, and seeks a shady retreat during dry periods. After the summer passes and the frosty nights of autumn come in, the Toad crawls into some crevice in

a wall or tree, or any convenient hole likely to afford the necessary shelter, for its annual hibernation.

The Natterjack (*Bufo calamita*, Plate XVI.).

The Natterjack seldom exceeds 3 inches in length. Casually observed, this animal might be mistaken for the Common Toad, although the latter is larger and more massive in form. More closely observed, it will be seen that the Natterjack has rather projecting eyes, somewhat elevated eyelids, and the head proportions are less striking than in the case of the Toad. Unlike the latter, too, the female Natterjack approaches nearer the size of its mate. In colour the Natterjack is light greenish-yellow, inclining somewhat to brown, with irregular green markings over the upper surface. A distinctive feature is the bright yellow line that passes down the centre of the back, although occasionally this mark is absent in some specimens. The under portion of the body is pale or whitish-yellow, with numerous dark specks.

"The Toad crawls, the Frog leaps, but the Natterjack runs." This is a popular way to phrase the actions of these amphibians, although it is not scientifically correct. Still, the Natterjack in some quarters has been baptized the "Running Toad" from its rather peculiar method of locomotion, that resembles more of a run than a crawl or hop. From infancy onwards the Natterjack much resembles the Common Toad.

Radiograph of Toad.

C. F. Oakley

This species is usually found about ditches, stagnant pools, and such places, where it breeds. Evidently it is local in its distribution, although where found it seems to be quite plentiful. It is by no means common north of the Tweed. The animal has an extremely hoarse croak, and heard in the quiet of a summer evening, this croaking cannot but attract the wayfarer's notice. When heard in concert, the noise is remarkably striking, as the sound carries a long distance in the still twilight. As one looks down upon a Toad or Natterjack in the grass while the afterglow dips beyond the hill-crests, there is something attractive about the eyes of these creatures one cannot well explain. A Toad moving from the shelter of a dock-leaf, or a Natterjack coming from the swamp, arrests the eye, and causes one to question the appearance of such a creature under such conditions. None of the same race do so.

Weirdly strange is the fall of eventide as the shadows lengthen out, and the red sun clings to the western hilltops. One then thinks of the fading colours of the garden, and would fain have them remain, but the Owl flies over the meadow, and the dandelion shuts its yellow bloom against the darkening hours. The broad smile of reeking earth fades in the haze, and the still silence marks the hour when the Bats fly round the garden border.

> "The past is past—I see the future stretch
> All dark and barren as a rainy sea."

Then the Owl comes again on noiseless wing, settles

on the field post, turns its massive head around, and again slides over the meadow. At the distance you can see its great round eyes that pierce the shadows—a feathered cat upon the wing. While the Owl is hawking the crepuscular insects issue forth—those big-bodied fliers we speak of as Moths—dancing about the hedges and ditches, especially where willows abound. These are but the Butterflies of the night, just as the Owls and Bats are the birds of the darkened hours.

> "And pluck the wings of painted Butterflies
> To fan the moonbeams from his sleeping eyes."

These insects live on the honied dew of the night flowers that do not fold their petals with the fall of night. Most of these flowers are very highly scented, and generally bright in colour (white or yellow), and as a rule grow in clusters. These two characteristics are doubtless for the everlasting good of the insects referred to. In this connection the honeysuckle may be named as one of these powerfully scented flowers that throws its petals open when the world sleeps, but which yields food to the roving night-fly in the interval. The Bee cannot draw honey from the honeysuckle flower, but certain Moths, dancing in the gloaming, can, and do. Nature has decreed so.

Of course, on the brown earth itself, the rodents move in vast colonies after dark. The Hare then feeds, and the Rabbits, Mice, Weasel, Hedgehog, and others, scour the land for food when the sun goes down and the moon stands silent as the clouds race past. While the

Partridges are calling in the cornfields, the aquatic denizens of the marshes croak on far into the night. It is then that the voice of the Natterjack is heard in the land—yet only in regions somewhat proscribed.

The Common Frog (*Rana temporaria*, Plate I.).

Practically all over the British Isles the Frog is a well-known frequenter of ponds, ditches, pools, or marshy lands. It is said to have been introduced into Ireland early in the eighteenth century, and to-day is considered as worthy of a place in the fauna of that island.

The Frog's year opens usually in late March, when the spawn may be found about the numerous waterways. The eggs are small, round, opaque bodies encased in a protective covering, gelatinous in character, and usually clustered together. These masses sink to the bottom of the pool, where they swell perceptibly until they attain a buoyancy that forces them to the surface of the water. The Tadpoles, on issuing from their envelopes, have gills with a fleshy sucker beneath the head. By the latter appendage they are enabled to hold firmly to any object the sway of the water may drive them against. There is a depression on the under side of the head that later becomes active, and ultimately opens, fashioning the alimentary canal. This enables the creature to feed upon the tender and succulent vegetation within its reach. Then this sucker splits in twain, the external gills are replaced by internal substitutes

encased in chambers. The gills are gradually absorbed, only a small aperture being left, through which the water entering the mouth is ejected. When about five weeks old the hind-legs are formed, and these gradually increase in length, size, and usefulness. The lungs, evolved via the gullet, come into action practically with the growth of the hind-legs. Once they are working in unison, the Tadpole gains the surface of the water, and breathes the air direct. In the interval the fore-legs have been forming underneath the skin, and these now protrude. A day or two afterwards the Tadpole tail disappears, the mouth widens, the tongue visibly enlarges, and the eyes break through the skin. These eyes are large and bright, and surrounded by a faint yellow circle. This brilliancy of the eyes continues throughout the days of the Frog, and is one of the many attractive features in the adult animal.

It is after the fore-legs become active members that the Tadpole leaves off feeding on vegetable matter, and becomes exclusively a carnivorous animal. Once the Tadpole can paddle through a pool of water with its four limbs, it becomes a cannibal. Field or pond life is ever a battle-field—a Rob-Roy country—a simple question of the survival of the fittest. Tadpoles themselves annually die in thousands in every ditch, a prey to a stronger rival. When the Tadpole reaches the carnivorous stage, it does not scruple to slay and swallow its miniature brother.

Having attained the adult stage, it leaves the water

and thereafter is more of a terrestrial creature than otherwise. Frogs leave the water occasionally in large numbers, doubtless under certain atmospheric conditions, and abnormal numbers may then be noted in fields and meadows. Such instances no doubt have given rise to the rustic belief in some quarters that the clouds "rain Frogs" sometimes.

The head of the Frog is triangular in shape. The teeth are arranged in single file, and an irregular row adorns the palate. The tongue lobs at its tip, and when idle this is kept folded back. The third toe of the fore-feet is longest and the second one the shortest. On the hind-legs the fourth toe is longest, and all are webbed. The hind-legs are half as long as the body, and tucked well underneath when in repose. The skin is smooth throughout unless about the thighs, where some few wrinkles appear.

Yellowish-brown is the predominant colour, with distinct black spots. An elongated patch of brown is over the temples, and a faint line runs down either side of the back. Still, beyond the ground colouring no really definite colours can be given, as Frogs vary considerably in this direction, doubtless attributable to their special environments. As a rule, however, Frogs are yellow, with dark markings. A casual glance at the creature as it leaps through the vegetation will confirm this. In a semi-domesticated state the writer has seen Frogs varying in colour from a bright yellow to a warm brown, down to decided black.

Although a full-grown Frog is only some 3 inches in length, it possesses a very pronounced voice. It gives vent to a loud croak, and there is something attractive about a "Frog concert" when heard in the still evening by the edge of some lonely roadway.

Frogs hibernate after the fashion of their kind. They pass the winter months in holes of almost any description. The warmth of spring again forces them from these retreats, when they at once commence love-making. These creatures often live to a great age, and several are known to the writer that have lived in a city garden for twenty and thirty years.

The Edible Frog (*Rana esculenta*, Plate XV.).

Students, collectors, and the general body of amateur naturalists, have as a rule a desire to add to and augment the number of native species of animals or plants in which they have a special interest. The ornithologist is keen on including in the British fauna the Sand Grouse, Glossy Ibis, Bohemian Wagwing, and others; the entomologist aims at fixing on his list the exotic specimen that accidentally reaches our shores in a batch of imported fruit; the botanist's fond hope is to locate some rare plant where no such plant ever existed before. It is all so very excusable, as one may judge human nature.

In keeping with the text, the Edible Frog and its claim to inclusion in the British fauna may be put in the same questionable category. No doubt this animal

has a certain claim to a place on the British list, but no one can explain the reason why with any degree of satisfaction. In certain localities it has been identified, but how it reached such places is somewhat of a mystery to naturalists generally ; it is supposed that

FIG. 4.—SKELETON OF EDIBLE FROG SHOWN WITHIN THE OUTLINE OF THE BODY.

Sch., Scapula ; *O.*, humerus ; *U.*, conjoined radius and ulna ; *Hw.*, carpal bones ; *M.*, metacarpal bones ; *II.-V.*, digits of manus ; *W.*, vertebræ ; *St.*, urostyle ; *D.*, ilium ; *Osch.*, femur ; *Usch.*, conjoined tibia and fibula ; *Fw.*, calcaneo-astragalus portion of tarsus ; *Mf.*, metatarsal bones ; *I.-V.*, digits of the pes.

(From Schmeil's "Text-Book of Zoology.")

this noted croaker was introduced into England by monks from Europe prior to the Reformation. It is indigenous to Europe, Western Asia, and North Africa ; in France it is considered a table dainty.

It is distinguished from the Common Frog by having no distinctively dark mark passing from the eye to the

shoulder. The vocal sacs at the angle of the mouth are absent in the Common species. These sacs are visibly extended during the operation of croaking, while the faint line which extends along the back of the Edible Frog is entirely absent in *Rana temporaria*.

The markings of the Edible Frog are very distinct and pronounced. It is also larger than the Common species, and has quite a resonant voice. It seems to be far more aquatic than its compeer, taking kindly to pools, ponds, ditches, or, indeed, any marsh or moist spots on the landscape.

More minutely considered, the Edible Frog has its toes cylindrical, bulging at the tips, and the webs somewhat notched. The fourth toe of the hind-foot is about one-fourth longer than the third and fifth. The head is triangular, nostrils midway between the eye and muzzle, teeth on palate and in line with the nasal openings, tongue broad, colour green, and length about 3 inches. In southern countries its range is limited to eastern parts. It dines on Worms, Snails, insects, and the like, not objecting to even its own kind in the earlier stages of their existence.

This species is occasionally spoken of as the Green Frog, in opposition to the Common (Brown) Frog, and Bell mentions it as the Scottish Frog, but all the three names indicate the same species.

Our Amphibians, which are also known as Batrachians, are good subjects for the vivarium ; they must

Photo by Carl Edwards.

Rana esculenta, or Edible Frog.

be allowed tanks, which should be filled with water and furnished with growing water-plants. While they are given access to water, they should also be furnished with the equivalent of terrestrial conditions; in point, the vivarium must be a replica of their natural haunts.

CHAPTER VI

CLASSIFICATION

By the Editor

Zoologists, basing their conclusions on the most recent research, now classify the members of the Animal Kingdom into twelve great divisions, each of which is called a "Phylum" (plural, "phyla"). These divisions are—

1. Protozoa (Gr., *protos*, first; *zoon*, animal), comprising the simplest known animal forms, all of which are one-celled and microscopic in size.

2. Coelenterata (Gr., *koilos*, hollow; *enteron*, inside). This phylum includes the Hydra, Jelly-Fish, and Sea-Anemones.

3. Porifera (L., *porus*, a pore; *ferre*, to bear). The Sponges.

4. Echinodermata (Gr., *echinos*, hedgehog; *derma*, skin), including Starfish, Sea-Urchins, Sea-Cucumbers.

5. Annelida (L., *annulus*, a ring). Ringed or segmented Worms, of which the Earth-Worm is an example.

6. Platyhelminthes (Gr., *platys*, flat; *helmins*, *-inthos*, a worm). Flat-Worms, Whirl-Worms, Liver-Flukes, Tape-Worms, Ribbon-Worms.

7. Nematoda (Gr. *nema*, a thread; *eidos*, form). Thread-Worms (unsegmented).

8. Polyzoa (Gr. *polys*, many; *zoon*, an animal). Sea-Mats, etc. The exact position of the Polyzoa in the Animal Kingdom is not determined. It is suggested that they should be joined with the Brachiopods to form a phylum under the name "Molluscoidea."

9. Rotifera (L., *rota*, a wheel; *ferre*, to carry). This phylum comprises the so-called "Wheel-Animalcules," or Rotifers. They are minute in proportions, requiring microscopic examination, yet they are well-organized animals.

10. Mollusca (L., *mollis*, soft). Snails and so-called "Shellfish," Cuttle-Fish, Slugs.

11. Arthropoda (Gr. *arthros*, a joint; *pous*, a foot). Animals with jointed appendages or limbs. This phylum includes the Crustacea (Crabs, Lobsters, Barnacles, Water-Fleas, etc.), the Centipedes, insects, Spiders, and Mites.

12. Chordata (Gr., *chorde*, string), including all the vertebrate animals.

The phylum Chordata, or, as it is sometimes termed, "Vertebrata," may be divided into two subphyla:

1. Acrania (Gr., *a-*, without; *cranion*, skull), including animals such as Lancelets and Ascidians,

without skull, vertebræ, ribs, jaws, or limbs, but possessing a notochord, which is, as it were, the promise of the spinal column in the higher vertebrates.

2. CRANIOTA, animals with skulls, vertebræ, etc.

The subphylum CRANIOTA embraces the following classes:

Class 1. PISCES—Fishes.
Class 2. AMPHIBIA—Newts, Frogs, etc.
Class 3. REPTILIA—Lizards, Snakes, etc.
Class 4. AVES—Birds.
Class 5. MAMMALIA—Mammals, including Man.

From this survey we are enabled to see the relative positions of the Amphibians and Reptiles in the Animal Kingdom, and it will be observed that in the scale, or tree, of life-forms, the Reptiles, for various reasons, occupy a higher position than the Amphibians. Both classes have a very ancient lineage, but it is probable that Amphibians came into existence before Reptiles. Fossil remains indicate that both existed far back in geological time, but Amphibians have been traced as far back as the Carboniferous (coal-bearing) strata, which are older than the Permian rocks, in which the first ossil traces of Reptiles have been discovered. We have reason to think that Amphibians were the dominant animals in Carboniferous times ; some kinds, now extinct, then attained large proportions. The erstwhile dominant Amphibians, however, in time lost their ascendancy, and gave place to the Reptiles, which

seem to have appeared, as stated, in Permian times, but they evidently reached their most powerful position in the Jurassic period, which may be included in the "Middle Ages" of geological time. Fossil remains of reptiles of huge proportions have been found. In spite of the fact that there are many existing species of Amphibians in the world, and even more Reptiles, both

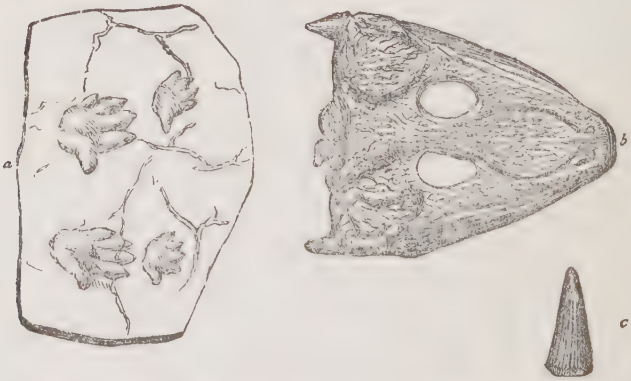


FIG. 5.—FOSSIL REMAINS OF AN OLD-WORLD AMPHIBIAN (*Labyrinthodon giganteum*).

a, Footprints; *b*, head; *c*, tooth.

classes should be looked upon as "back numbers"; they have lost their ancient supremacy; numberless forms have become extinct, and in point of size they are now reduced to mean proportions. In the days of their supremacy they were the terrors of the Animal World; now the dwarfed descendants tread the earth in fear, trembling before the onslaught of the Mammals which are supreme.

1. The Natterjack (*Bufo calamita*).
2. The Common Toad (*Bufo vulgaris*)

The Amphibia are classified as follows:

Order 1. The Urodela (Gr., *oura*, tail; *dēlos*, conspicuous). Amphibians with long, round bodies, and

Fig. 6.—Skeleton of a Fossil Flying Reptile (*Pterodactylus crassirostris*), and (A) Restoration of the Animal on a Smaller Scale.

having long, flattened tails which they retain throughout their existence.

Order 2. The Anura (Gr., *a-*, *an-*, without; *oura*, tail), including those Amphibians which in the adult stage have lost all signs of a tail.

Order 3. The GYMNOPHIONA (Gr. *gumnos*, naked ; *ophis*, snake). This Order includes wormlike Amphibians, with only rudimentary eyes, and having no tail or limbs of any kind.

As the reader will already have divined, in Britain we have no representatives of the third Order, which, indeed, only includes about twenty-five species the world over. Our three Newts belong to the Order Urodela, Suborder Salamandroidea, Family Salamandridæ. Of the Order Urodela there are some one hundred species in the world. Our two Frogs and two Toads are of the Order Anura, Suborder Phaneroglossa (visible tongue). This Suborder is classed into two Groups—(1) Arcifera ; (2) Firmisterna. The Arcifera are divided into three Families, to the first of which, the Bofonidæ, our Toads belong. The Group Firmisterna enbraces one Family, the Ranidæ, inclusive of our two Froggies. The Order Anura has about eight hundred representatives. From the figures given it will be seen that there are over nine hundred existing Amphibians, of which only seven can be claimed as British.

The Reptiles are classified thus :

Order 1. The RHYNCHOCEPHALA (Gr., *runchos*, strong snout ; *cephalē*, head). There is but one species of this Order, and it is resident in New Zealand. It differs from all existing Reptiles, and is regarded as a surviving remnant of an Order which has perished.

Order 2. LACERTILLIA—Lizards.

Order 3. Ophidia—Snakes.

Order 4. Chelonia—The partly aquatic Turtles, and the terrestrial Tortoises.

Order 5. Crocodilia—Alligators and Crocodiles.

Of these five Orders two are represented in the British fauna—the Lacertillia and Ophidia. The Lacertillia of the world are divided into about twenty families, of which only two are represented in Britain—Family Anguidæ by *Anguis fragilis*, the Slow-Worm ; and Family Lacertidæ, by our four Lizards, *Lacerta vivipera*, *L. agilis*, *L. viridis*, and *L. muralis*. The world's Ophidia are divided into numerous families, of which two have British species. The Adder belongs to the Family Viperidæ ; the Ringed and Smooth Snakes are of the Family Colubridæ.

The Reptiles of the world number upwards of 4,000 species, and in proportion thereto our eight representatives are very inconspicuous. While comparatively few Reptiles are harmful to man, persons who are not naturalists usually regard all as pests ; such, perhaps, may find consolation in the fewness of British Reptiles, and regard it as some compensation to those who endure the changeful meteorological conditions of Great Britain.

INDEX

Adder, the, 1, 7, 40-47
  poison fangs of, 46
Amphibians, 2, 3, 49-77
  classification of, 81-82
  fossil, 79
  of past ages, 79
Anguis fragilis, 7-15
Anura, the, 81

Batrachians, the, 76
Blind-worm, the, 6, 9
British Reptiles, fewness of, 83
Bufo calamita, 68
  vulgaris, 64

Chameleons, 30
Chelonia imbricata, 48
Chelonia, the, 83
Classification, 77-83
Common Lizard, 17
  Toad, 64-68
Coronella austriaca, 34
Crested Newt, 50
Crocodilia, the, 83

Fossil Flying Reptile, 81
Frog, Common, 71-74
  Edible, 74-76

Geckos, 30
Glass Snakes, 6
Grass Snake, 36-40
Great Warted Newt, 50-57
Green Lizard, 7, 25-27
Gymnophiona, the, 82

Hawksbill Turtle, 48

Labyrinthodon giganteum, 80
Lacerta agilis, 21
  muralis, 27
  viridis, 25-27
  vivipara, 16
Lacertilia, the, 82
Leathery Turtle, 49
Lizard, Common, 17
  Green, 7, 25-27
  Sand, 7, 21, 22-25
  Viviparous, 7, 16-22
  Wall, 7, 27-28
Lizards, 6-30
  as pets, 28-30
  characteristics of, 15
  digestive tract of, 16
  distribution of, 18
  food of, 15
  of the world, 7

Molge cristata, 50
  palmata, 60
  vulgaris, 57

Natterjack, the, 68
Newt, Great Warted, or Crested, 50-57
  Palmated, 60-63
  Smooth, 57-60
Newts, 49-64

Ophidia, the, 83

Palmated Newt, 60-63
Pterodactylus crassirostris, 81

Rana esculenta, 74

Index

Rana temporaria, 71
Reptiles, British species of, 7
classification of, 82-83
definition of, 6
of the world, 7
Rhynchocephala, the, 82
Ringed Snake, the, 7, 36-40

Sand Lizard, 7, 21, 22-25
Slow-worm, 1, 7-10
Smooth Newt, 57-60
Snake, 7, 34-35
Snake, Grass, 36-40
Ringed, 7, 36-40
Smooth, 7, 34-35, 39
Snakes, 2, 31-47
Glass, 6
Sphargis coriacea, 49

Toad, Common, 64-68
Natterjack, 68
Tropidonotus natrix, 36
Turtle, Hawksbill, 48
Leathery, 49
Turtles, 47-49

Urodela, the, 81

Viper, the, 40-47
Vipera berus, 40
Vivarium, the, 29, 47, 76
Viviparous Lizard, 7, 16-22

Wall Lizard, 7, 27-28

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